uPAC-7186EX User Manual

Version 1.0 beta1, October 2008

Service and usage information for

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Edited by Anna Huang

Important Notices

Warranty

All products manufactured by ICP DAS are under warranty regarding defective materials for a period of one year, beginning from the date of delivery to the original purchaser.

Warning

ICP DAS assumes no liability for any damage resulting from the use of this product.
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1. Introduction

The uPAC-7186EX is a palm-size programmable automation controller that with Ethernet, RS-232 and RS-485 communication. ICP DAS provides easy-to-use Software development tool kits (Framework, Xserver, VxComm, Modbus function Library). Users can use them to easily integrate serial devices to have Ethernet/Internet communication ability and through the standard Modbus protocol to Communicate with SCADA software (Indusoft, ISaGARF, DasyLab, Trace Mode, Citect, iFix and so forth).

For the hardware, it also supports for I/O expansion bus interface. The I/O expansion bus can be used to implement various I/O functions such as D/I, D/O, A/D, D/A, Timer/Counter, UART, flash memory, battery backup SRAM, ASIC key and other I/O functions. This I/O expansion bus can implement nearly all kinds of I/O functions, but only one expansion board can be added. There are more than 50 boards available for uPAC-7186EX series module so far.

Package List

In addition to this manual, the shipping package includes the following items:

- One uPAC-7186EX module
- One download cable (CA0910)
- One companion CD containing software drivers and digital versions of the user manuals
- One copy of the release notes

1.1. Features

- **Support for Virtual COM technology**

  PC can create virtual COM ports to map the RS-232, RS-485 of uPAC-7186EX series module using the VxComm technology. The software running on the PC can operate the virtual COM ports like a standard COM port to access the serial devices connect to the uPAC-7186EX. In other words, the original software developed for the serial devices can access the serial devices via the Ethernet/Internet without any modification.

  Each PC can control up to 256 COM ports (including real COM ports). Using the I/O expansion board, each uPAC-7186EX can have up to 8 COM ports.

- **Support Modbus Protocol**

  Using the Modbus firmware, uPAC-7186EX offers following Modbus features:

  1. Modbus/TCP/RTU/ASCII slave
  2. Modbus/TCP/RTU/ASCII master
  3. Gateway for Modbus/TCP to Modbus/RTU

- **VxComm Technique Supported**

  VxComm technique is used to create virtual COM ports on PC (for windows 2K/XP) to map remote COM ports of PDS-700, I-7188E, I-8000 and uPAC-7186EX over the Ethernet. Using the technique, RS-232/485 software can access devices locally (via the physical RS-232/485 bus) or remotely (via the Ethernet). The RS-232/485 software only needs to change COM port number from the physical COM port to virtual COM port.

- **Ethernet Protocols**

  TCP, UDP, IP, ICMP and ARP.

- **Easy-Use Software Development Tool Kits (Using C Language)**

  The custom firmware can be developed for uPAC-7186EX series module using the SDK (Framework, Xserver, Modbus function libray) provided by ICP DAS.

- **Support Web configuration**

  uPAC-7186EX series module has a build-in web server for configuration. You can use standard web browsers (such as IE, Netscape, Firefox, and etc) to configure its Ethernet and COM ports configurations.

- **Remote Configuration/Maintenance**

  uPAC-7186EX series module can be operated via the Ethernet (TCP/IP or UDP) or RS-232, to allow tasks such as downloading files, configuration updating the MiniOS7 image etc.

- **Built-in Watchdog Timer (WDT)**

  uPAC-7186EX series module includes an internal watchdog timer (WDT). The watchdog timer will trigger a system reset if the main program fails or neglects to regularly service the watchdog. The intention is to bring the system back from the hung state into normal operation.

- **I/O Expansion Bus Interface**

  The uPAC-7186EX series module supports the use of an I/O Expansion bus to add a single I/O Expansion Board. ICP DAS provides all function libraries for I/O Expansion Boards to enable easy use of the I/O Expansion Board functions.

uPAC-7186EX series module has more features as followings:

- **RoHS Compliance and CE Certification**
- **Low Power Input (10 to 30VDC) according to industrial environment**
- **Frame-Ground design for ESD protection**
- **Fire Retardant Materials (UL94-V0 Level) and Robust Case**
- **VxComm Driver for Windows NT 4.0, 2000/XP/2003 and Vista32**

1.2. Specifications

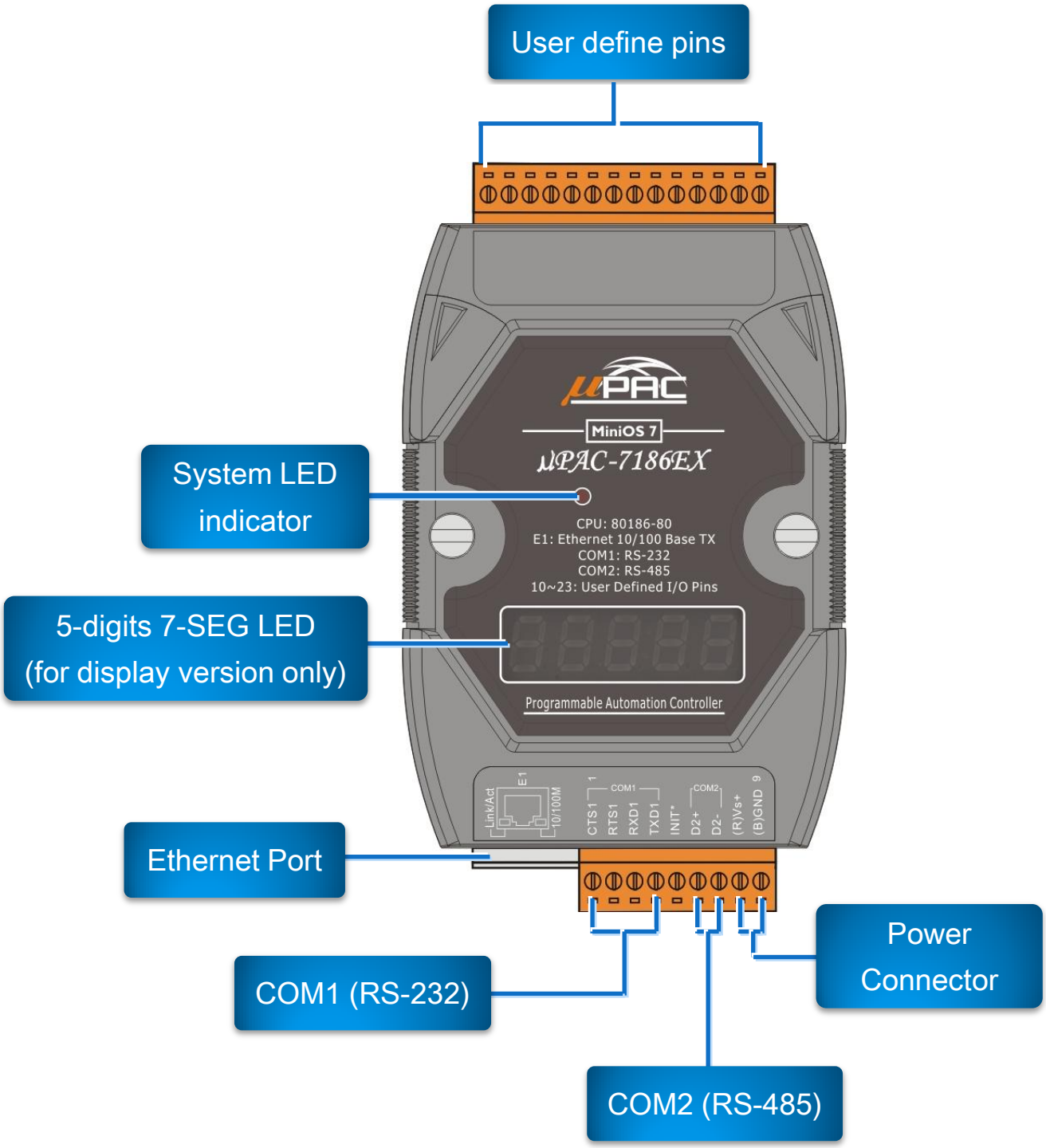
PACs	µPAC-7186EX	µPAC-7186EXD
CPU Specification		
CPU	80186 CPU, 80MHz or compatible	
SRAM	512K Bytes	
Flash	512K Bytes Erase unit is one sector (64K bytes); 100,000 erase/write cycles	
EEPROM	16K Bytes Data retention: 40 years; 1,000,000 erase/write cycles	
NVRAM	31 Bytes Battery backup, data valid up to 10 year	
RTC (Real Time Clock)	Year-2000 compliance; seconds, minutes, hours, date of the month; month, year, valid up from 1980 to 2079	
Hardware Serial Number	Yes	
Build-in Watchdog Timer	Yes	
Communication Interface		
COM 1	RS-232 (TXD, RXD, CTS, RTS and GND); Non-isolation	
COM 2	RS-485 (D2+, D2-; self-tuner ASIC inside); Non-isolation	
Ethernet Port	10/100Base-TX Ethernet Controller (Auto-negotiating, Auto_MDIX, LED indicator)	
COM Port Formats		
Data bit	7, 8	
Parity	None, Even, Odd, Mark, Space	
Stop bit	1	
Baud Rate	115200 bps Max.	
LED Display		
5-digit 7-segment LED	No	Yes
System LED Indicator	Yes	
Hardware Expansion		
I/O expansion bus	Yes	
User defined I/O pins	14 pins	
Operating Environment		
Operating temperature	-25°C to +75°C (-13°F to +167°F)	
Storage Temperature	-40°C to +80°C (-40°F to +176°F)	
Humidity	5% to 95%, Non-condensing	
Power		
Protection	Power reverse polarity protection	
Frame Ground	Yes (for ESD Protection)	
Required Supply Voltage	+10VDC to +30VDC (non-regulated)	
Power Consumption	1.5W	2.5W
Dimensions	123mm x 72mm x 33mm	

PACs	µPAC-7186EX-FD	µPAC-7186EXD-FD
CPU Specification		
CPU	80186 CPU, 80MHz or compatible	
SRAM	512K Bytes	
Flash	512K Bytes Erase unit is one sector (64K bytes); 100,000 erase/write cycles	
NAND Flash	64M Bytes Data retention: 10 years; 100,000 erase/write cycles	
EEPROM	16K Bytes Data retention: 40 years; 1,000,000 erase/write cycles	
RTC (Real Time Clock)	31 Bytes Battery backup, data valid up to 10 year	
Hardware Serial Number	Year-2000 compliance; seconds, minutes, hours, date of the month; month, year, valid up from 1980 to 2079	
Build-in Watchdog Timer	Yes	
Communication Interface		
COM 1	RS-232 (TXD, RXD, CTS, RTS and GND); Non-isolation	
COM 2	RS-485 (D2+, D2-; self-tuner ASIC inside); Non-isolation	
Ethernet Port	10/100Base-TX Ethernet Controller (Auto-negotiating, Auto_MDIX, LED indicator)	
COM Port Formats		
Data bit	7, 8	
Parity	None, Even, Odd, Mark, Space	
Stop bit	1	
Baud Rate	115200 bps Max.	
LED Display		
5-digit 7-segment LED	No	Yes
System LED Indicator	Yes	
Hardware Expansion		
I/O expansion bus	Yes	
User defined I/O pins	14 pins	
Operating Environment		
Operating temperature	-25°C to +75°C (-13°F to +167°F)	
Storage Temperature	-40°C to +80°C (-40°F to +176°F)	
Humidity	5% to 95%, Non-condensing	
Power		
Protection	Power reverse polarity protection	
Frame Ground	Yes (for ESD Protection)	
Required Supply Voltage	+10VDC to +30VDC (non-regulated)	
Power Consumption	2W	2W
Dimensions	123mm x 72mm x 33mm	

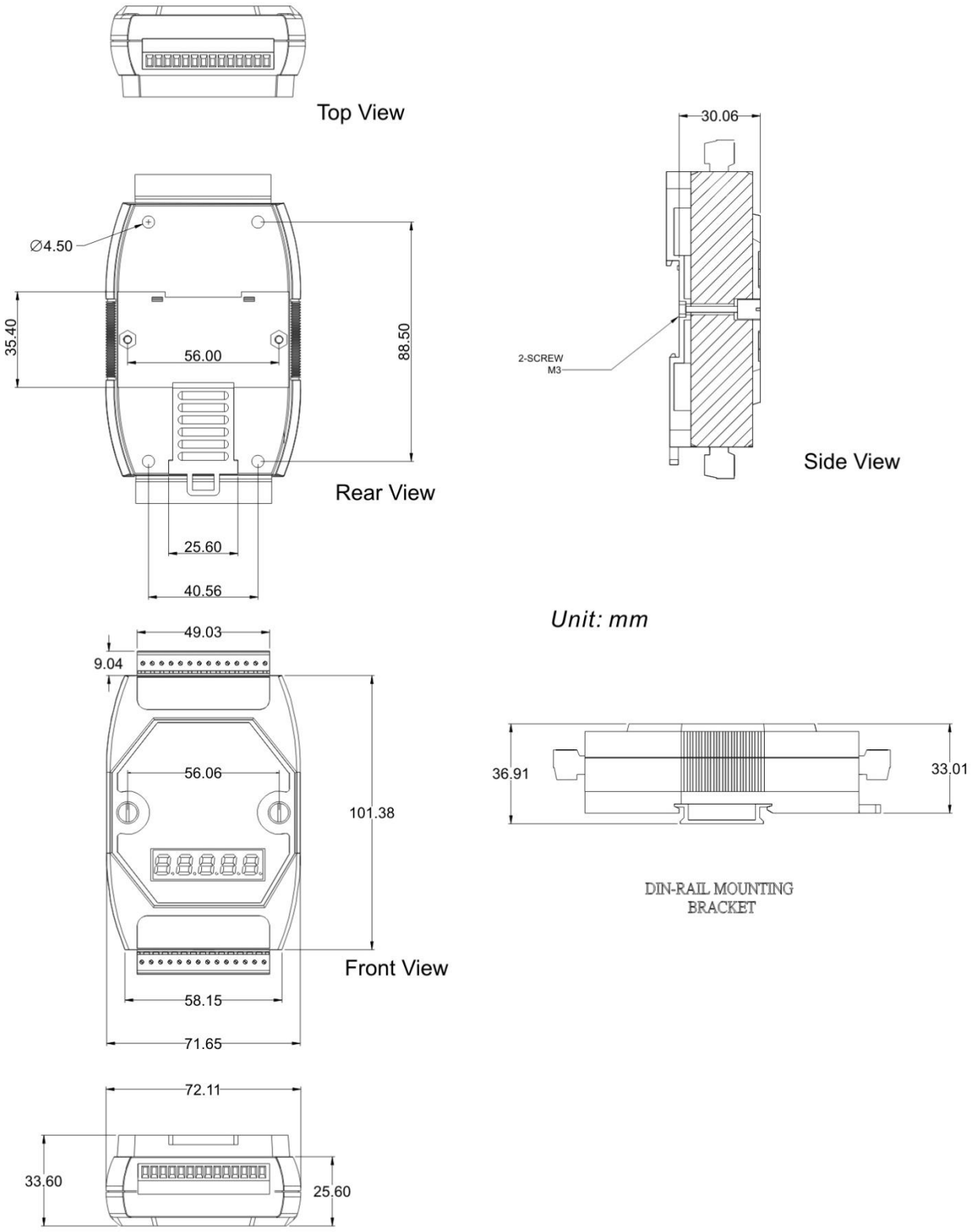
PACs	µPAC-7186EX-SD	µPAC-7186EXD-SD
CPU Specification		
CPU	80186 CPU, 80MHz or compatible	
SRAM	512K Bytes	
Flash	512K Bytes Erase unit is one sector (64K bytes); 100,000 erase/write cycles	
Micro SD	**1G Bytes**	
EEPROM	16K Bytes Data retention: 40 years; 1,000,000 erase/write cycles	
RTC (Real Time Clock)	31 Bytes Battery backup, data valid up to 10 year	
Hardware Serial Number	Year-2000 compliance; seconds, minutes, hours, date of the month; month, year, valid up from 1980 to 2079	
Build-in Watchdog Timer	Yes	
Communication Interface		
COM 1	RS-232 (TXD, RXD, CTS, RTS and GND); Non-isolation	
COM 2	RS-485 (D2+, D2-; self-tuner ASIC inside); Non-isolation	
Ethernet Port	10/100Base-TX Ethernet Controller (Auto-negotiating, Auto_MDIX, LED indicator)	
COM Port Formats		
Data bit	7, 8	
Parity	None, Even, Odd, Mark, Space	
Stop bit	1	
Baud Rate	115200 bps Max.	
LED Display		
5-digit 7-segment LED	No	Yes
System LED Indicator	Yes	
Hardware Expansion		
I/O expansion bus	Yes	
User defined I/O pins	14 pins	
Operating Environment		
Operating temperature	-25°C to +75°C (-13°F to +167°F)	
Storage Temperature	-40°C to +80°C (-40°F to +176°F)	
Humidity	5% to 95%, Non-condensing	
Power		
Protection	Power reverse polarity protection	
Frame Ground	Yes (for ESD Protection)	
Required Supply Voltage	+10VDC to +30VDC (non-regulated)	
Power Consumption	2W	2W
Dimensions	123mm x 72mm x 33mm	

PACs	µPAC-7186EX-SM	µPAC-7186EXD-SM
CPU Specification		
CPU	80186 CPU, 80MHz or compatible	
SRAM	**640K Bytes**	
Flash	16K Bytes Data retention: 40 years; 1,000,000 erase/write cycles	
EEPROM	31 Bytes Battery backup, data valid up to 10 year	
NVRAM	Year-2000 compliance; seconds, minutes, hours, date of the month; month, year, valid up from 1980 to 2079	
RTC (Real Time Clock)	Yes	
Hardware Serial Number	Yes	
Build-in Watchdog Timer	80186 CPU, 80MHz or compatible	
Communication Interface		
COM 1	RS-232 (TXD, RXD, CTS, RTS and GND); Non-isolation	
COM 2	RS-485 (D2+, D2-; self-tuner ASIC inside); Non-isolation	
Ethernet Port	10/100Base-TX Ethernet Controller (Auto-negotiating, Auto_MDIX, LED indicator)	
COM Port Formats		
Data bit	7, 8	
Parity	None, Even, Odd, Mark, Space	
Stop bit	1	
Baud Rate	115200 bps Max.	
LED Display		
5-digit 7-segment LED	No	Yes
System LED Indicator	Yes	
Hardware Expansion		
I/O expansion bus	Yes	
User defined I/O pins	14 pins	
Operating Environment		
Operating temperature	-25°C to +75°C (-13°F to +167°F)	
Storage Temperature	-40°C to +80°C (-40°F to +176°F)	
Humidity	5% to 95%, Non-condensing	
Power		
Protection	Power reverse polarity protection	
Frame Ground	Yes (for ESD Protection)	
Required Supply Voltage	+10VDC to +30VDC (non-regulated)	
Power Consumption	2W	2W
Dimensions	123mm x 72mm x 33mm	

1.3. Overview

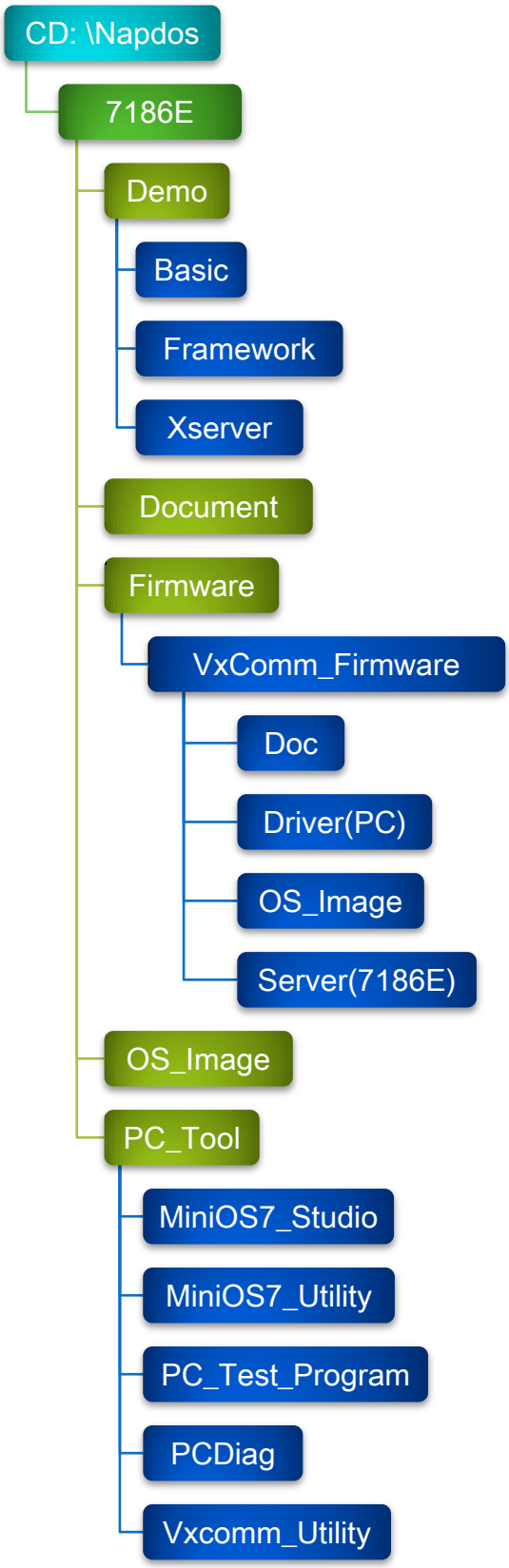

User define pins
System LED indicator
5-digits 7-SEG LED (for display version only)
Ethernet Port
COM1 (RS-232)
COM2 (RS-485)
Power Connector
MiniOS 7
uPAC-7186EX
CPU: 80186-80
E1: Ethernet 10/100 Base TX
COM1: RS-232
COM2: RS-485
10~23: User Defined I/O Pins
Programmable Automation Controller
Link/Act
10/100M
E1
CTS1
RTS1
RXD1
TXD1
INIT*
D2+
D2-
(R)Vs+
(B)GND
COM1
COM2

1.4. Dimension



1.5. Companion CD

This package comes with a CD that includes the following software and documention:



2. Quick Start

This chapter provides users with basic information needed to begin using the uPAC-7186EX.

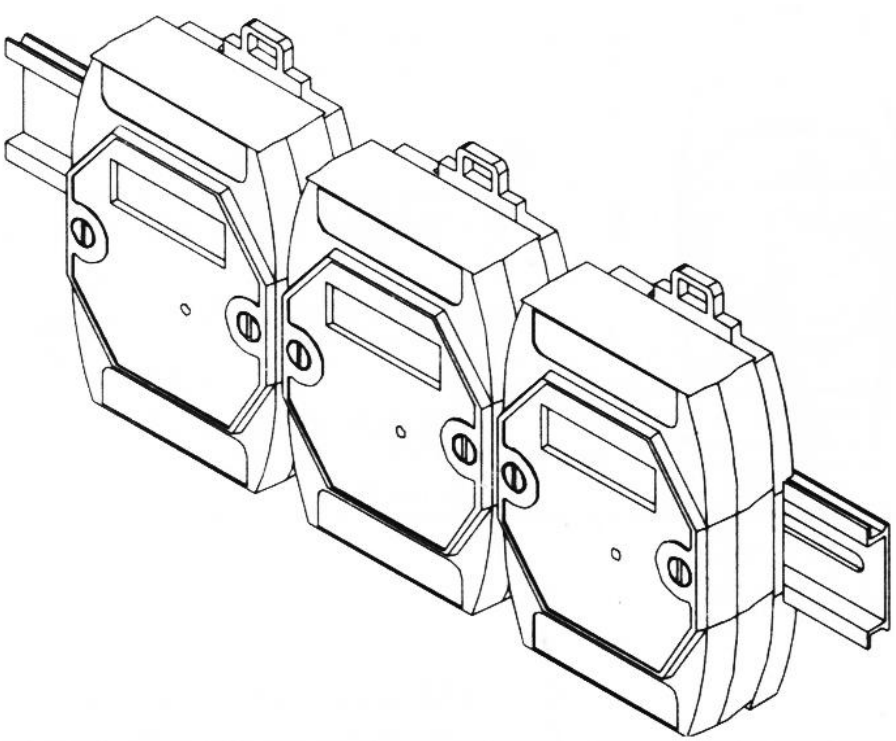
2.1. Hardware installation

2.1.1. Installing the uPAC-7186EX

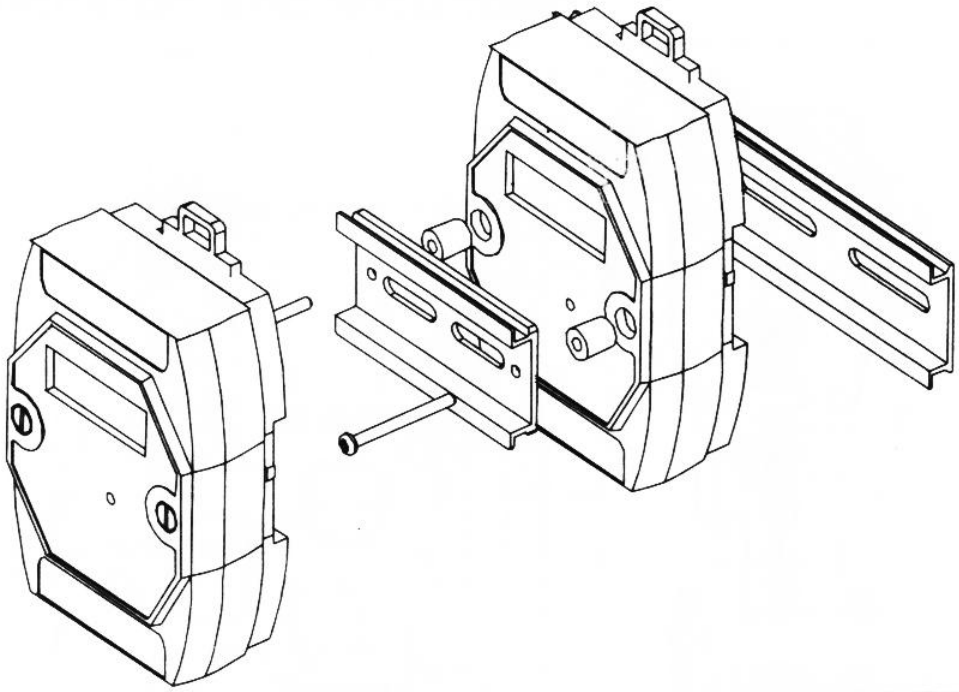
Step 1: Mounting the uPAC-7186EX

The uPAC-7186EX can either be mounted on DIN-rail or stack.

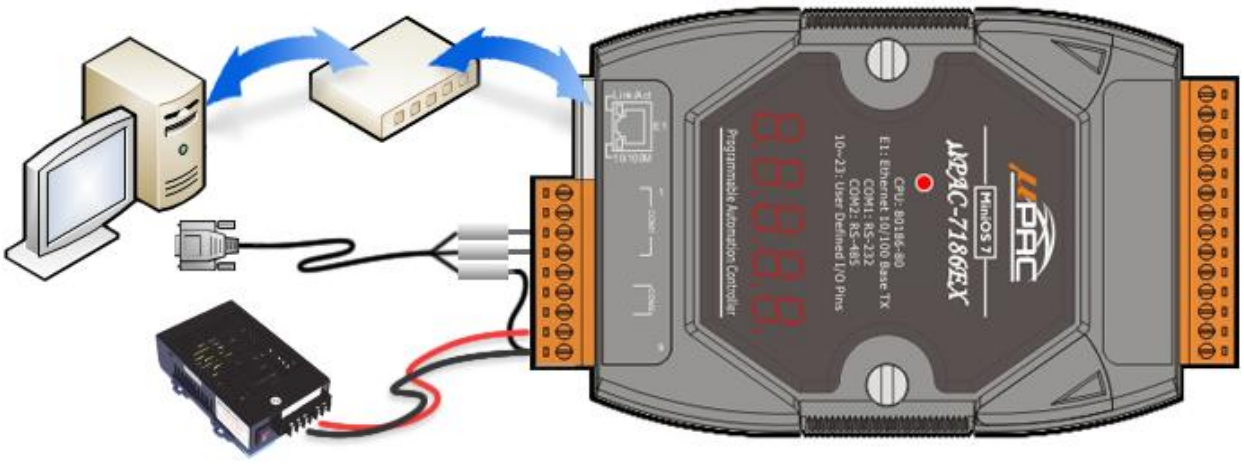
1: DIN-rail mounting



2: Stack mounting

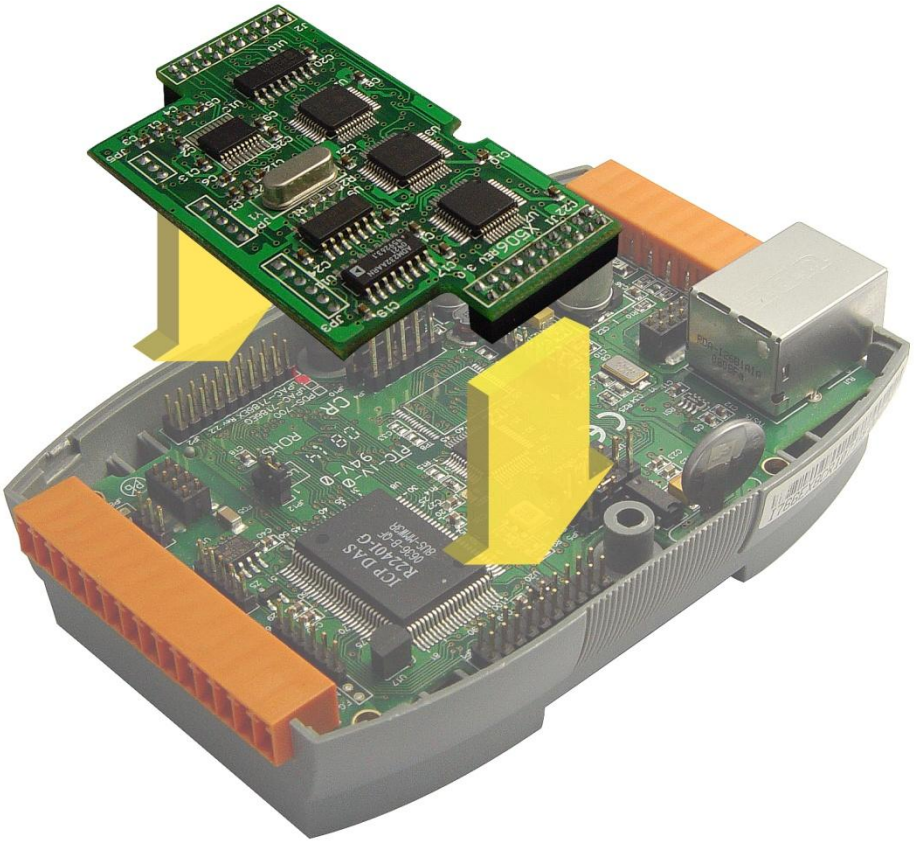


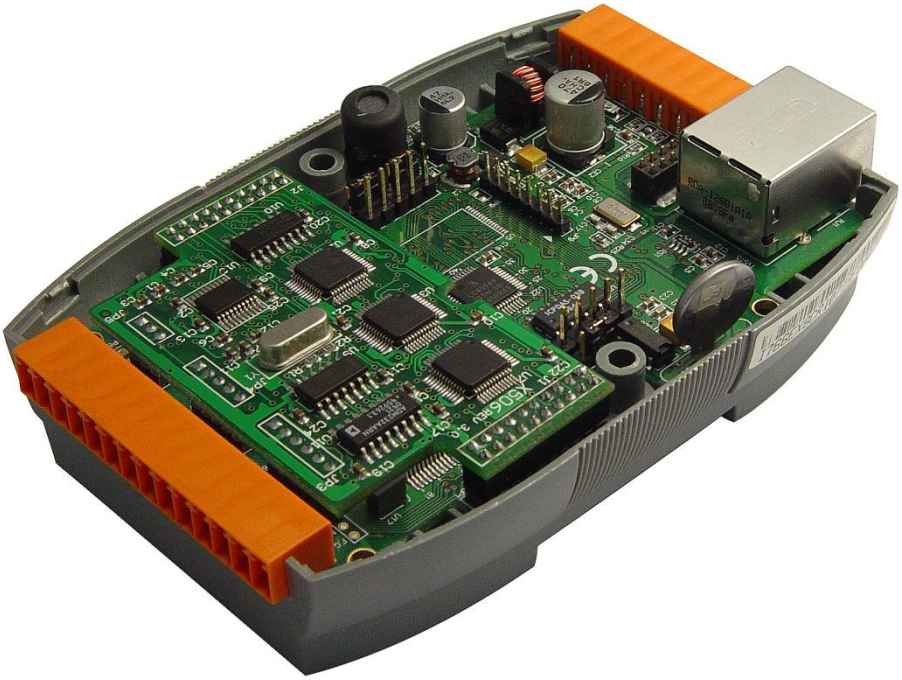
Step 2: Connecting the Host PC to the uPAC-7186EX



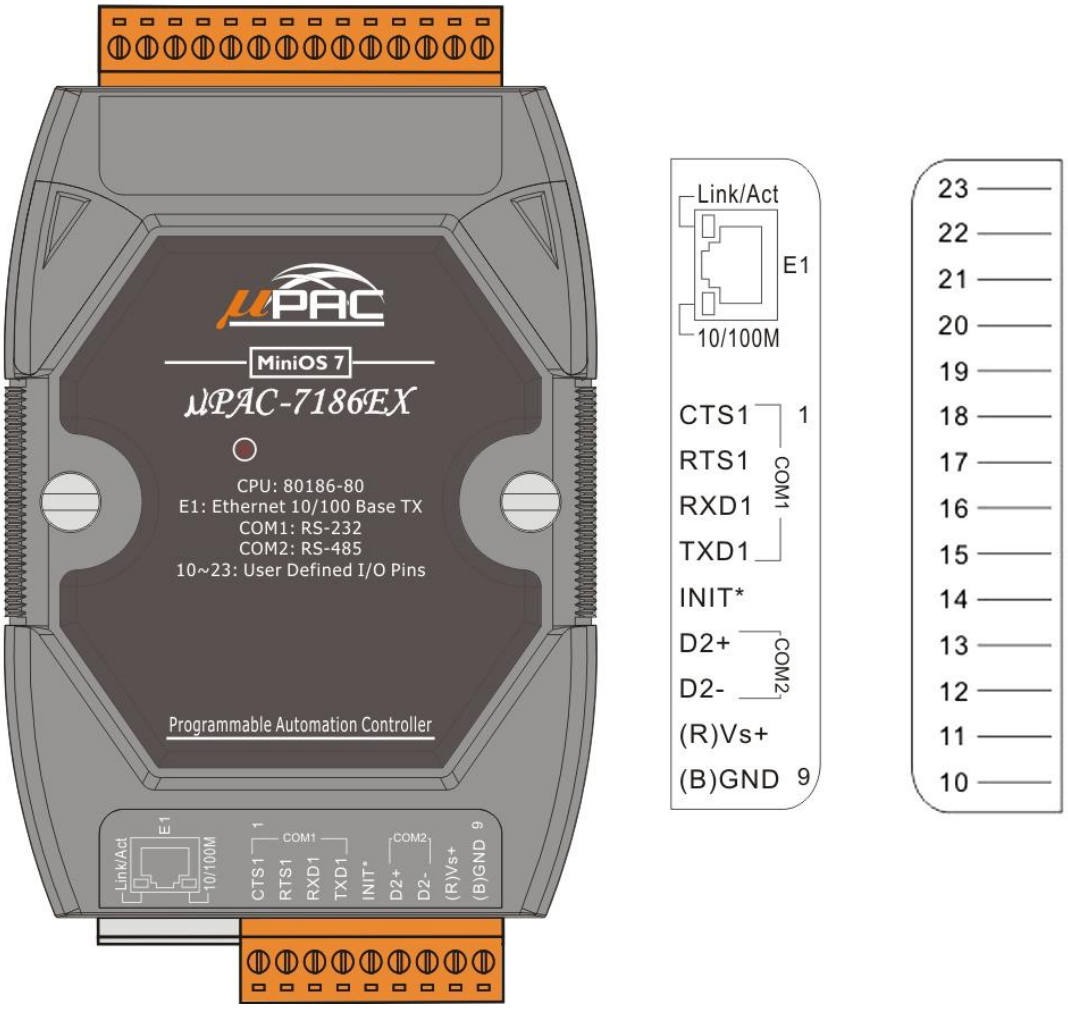
2.1.2. Mounting the I/O Expansion Bus

2.1.3. Mounting the I/O Expansion Bus





2.1.4. Wiring connections



The pin assignment of 9-pin screw terminal block is as follows:

Pin	Name	Description
1	CTS1	CTS pin for COM1 (RS-232)
2	RTS1	RTS pin for COM1 (RS-232)
3	RXD1	RXD pin for COM1 (RS-232)
4	TXD1	TXD pin for COM1 (RS-232)
5	INIT*	Initial pin
6	D2+	DATA+ pin for COM2 (RS-485)
7	D2-	DATA- pin for COM2 (RS-485)
8	Vs+	V+ of power supply (+10 to +30VDC, unregulated)
9	GND	GND for the power supply

The pin assignment of top 14-pin screw terminal block is as follows:

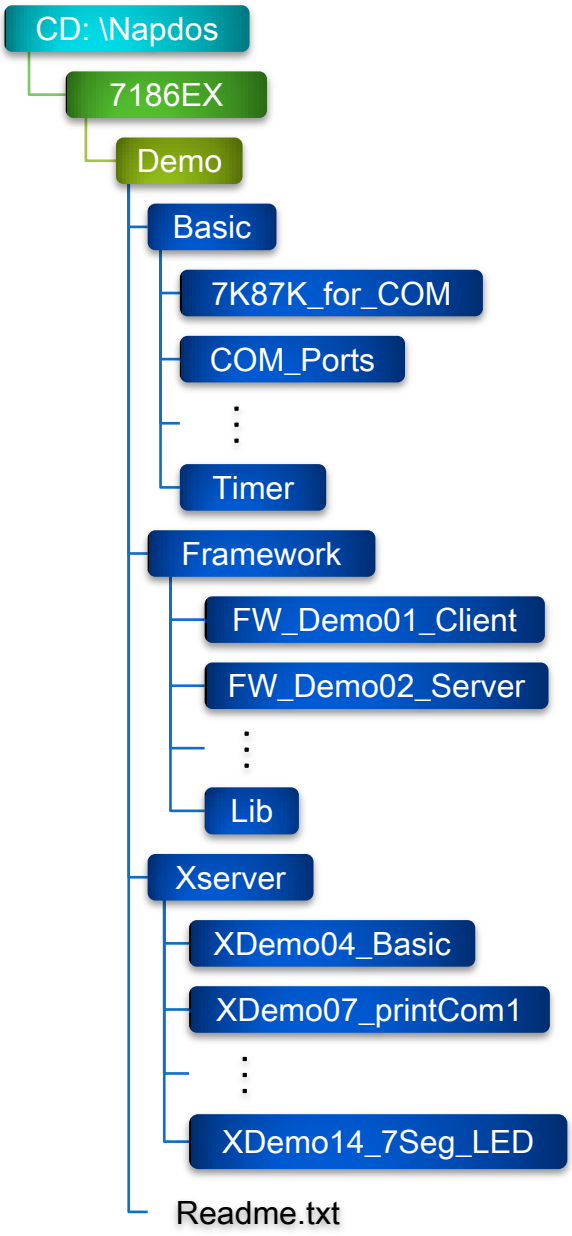
Pin	Name	Description
10	Pin 10	User defined pin 10
11	Pin 11	User defined pin 11
12	Pin 12	User defined pin 12
13	Pin 13	User defined pin 13
14	Pin 14	User defined pin 14
15	Pin 15	User defined pin 15
16	Pin 16	User defined pin 16
17	Pin 17	User defined pin 17
18	Pin 18	User defined pin 18
19	Pin 19	User defined pin 19
20	Pin 20	User defined pin 20
21	Pin 21	User defined pin 21
22	Pin 22	User defined pin 22
23	Pin 23	User defined pin 23

2.2. Software installation

All software resources are included on the companion CD, the following steps will help you to install the resources and software from the companion CD.

Step 1: Copy the "Demo" folder from the companion CD to the Host PC

The folder is an essential resource for users developing custom programs which contains libraries, header files, demo programs and more information as shown below:



Step 2: Install the MiniOS7 Utility

The MiniOS7 Utility is a tool that can be used to configure and upload files to the controller and is located at:

CD:\Napdos\minios7\utility\minios7_utility\

ftp://ftp.icpdas.com/pub/cd/8000cd/napdos/minios7/utility/minios7_utility/

2.3. MiniOS7 Utility for downloading programs

Before you begin using the MiniOS7 Utility to download programs, ensure that the controller is connected to the Host PC.

The download process has the following main steps: .

1. Establishing a connection
2. Download and executing programs on the controller
3. Making programs start automatically

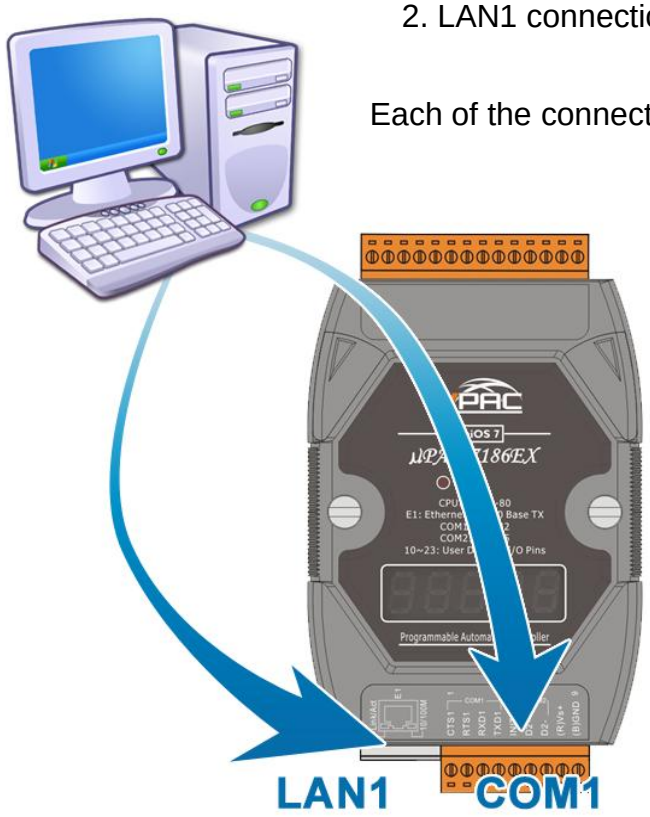
All of these main steps will be described in detail later.

2.3.1. Establishing a connection between the Host PC and the uPAC-7186EX

Connect the Host PC to the uPAC-7186EX with the following connection types:

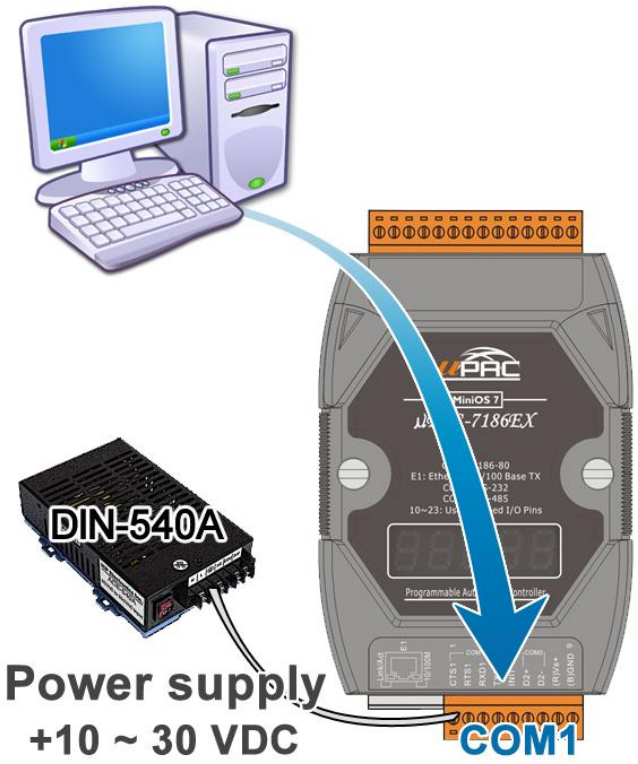
1. COM1 connection
2. LAN1 connection

Each of the connection types will be described in detail later.



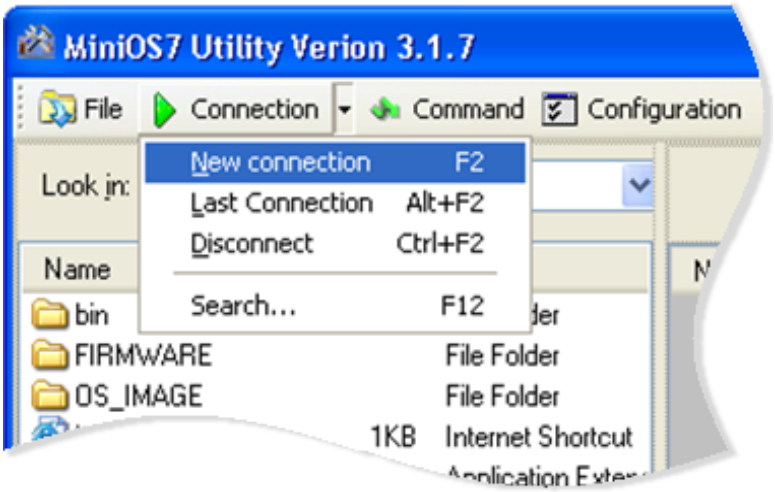
2.3.1.1. Steps to use a COM1 connection

Step 1: Connect the uPAC-7186EX to the host PC using a COM1 connection

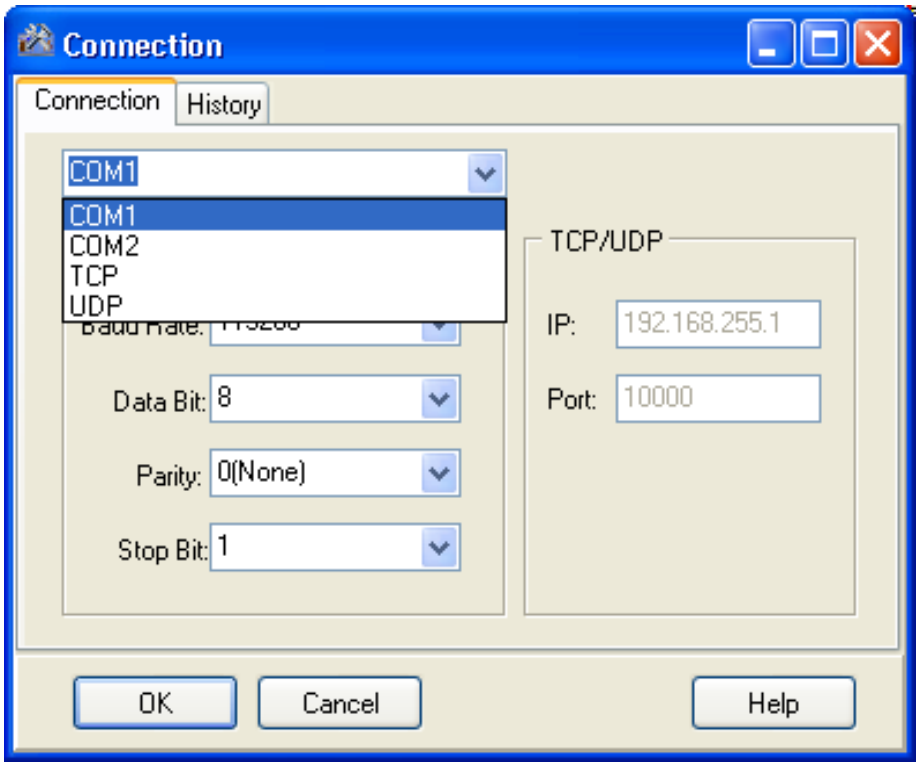


Step 2: Run the MiniOS7 Utility

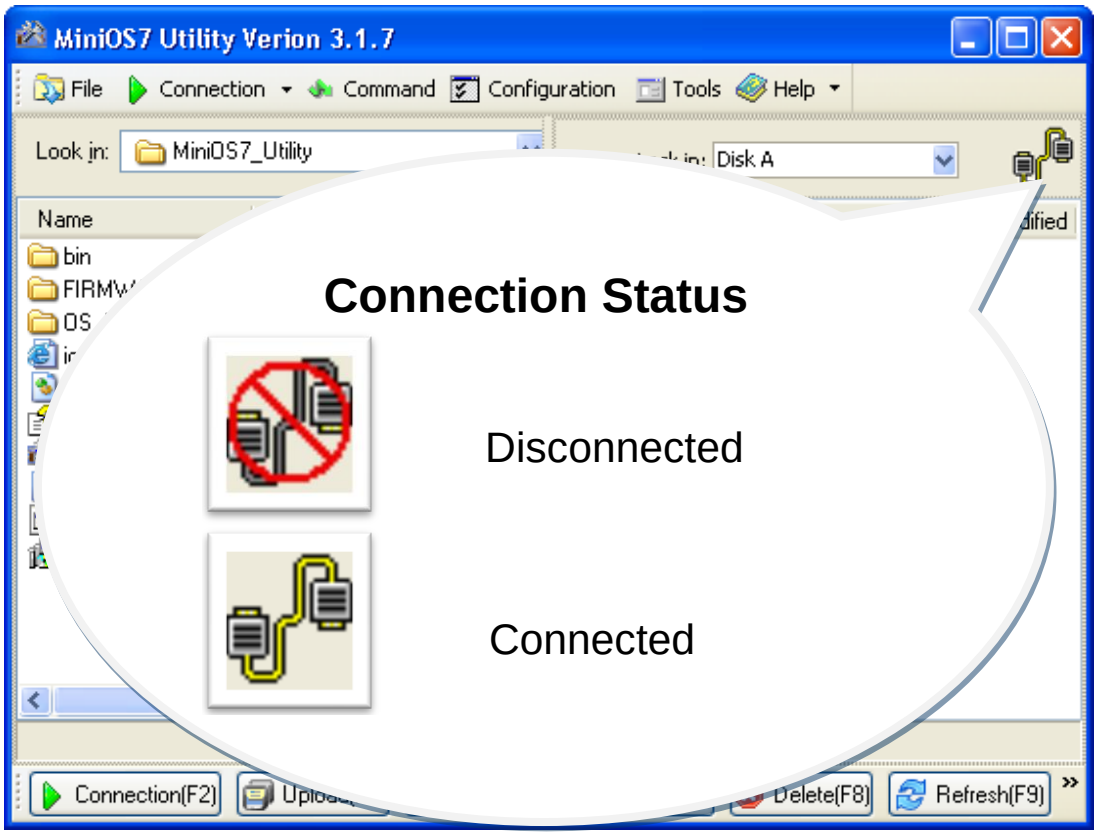
Step 3: Click the “New connection” from the “Connection” menu



Step 4: On the “Connection” dialog box, select “COM1” from the drop down list

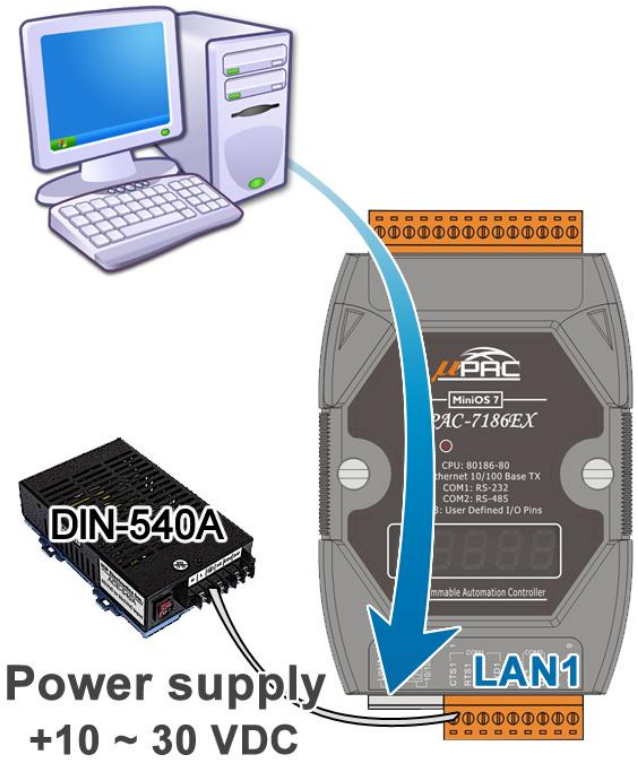


Step 5: The connection has already established



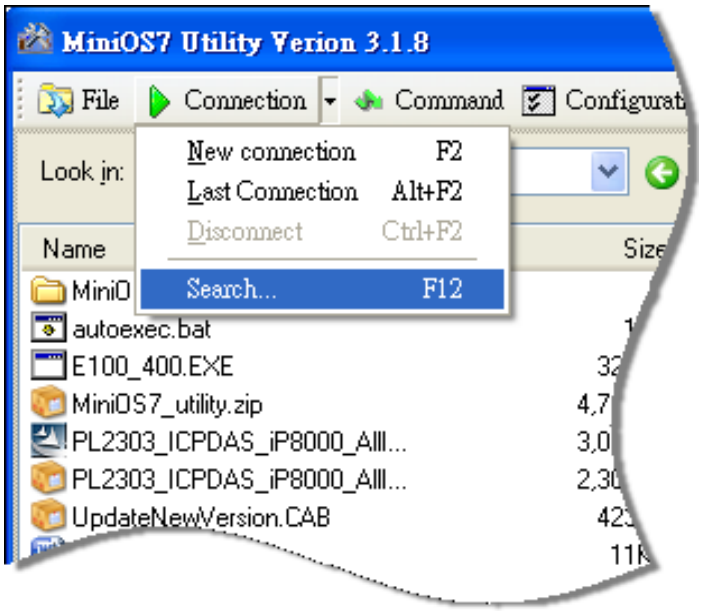
2.3.1.2. Steps to use a LAN1 connection

Step 1: Connect uPAC-7186EX to the host PC using a LAN1 connection

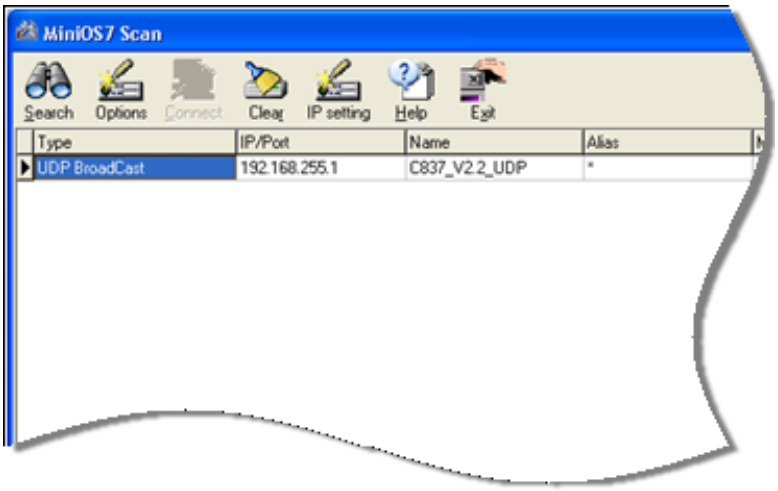


Step 2: Run the MiniOS7 Utility

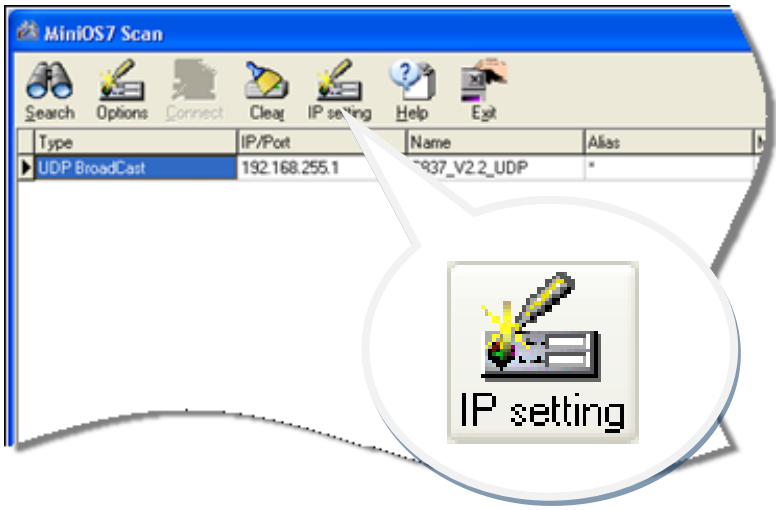
Step 3: Click the “Search” from the “Connection” menu



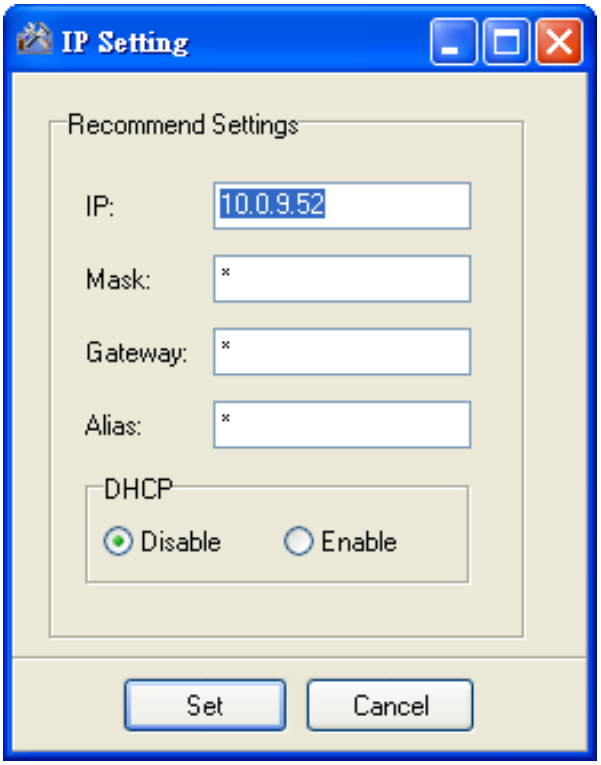
Step 4: On the “MiniOS7 Scan” dialog box, select “192.168.255.1” from the list



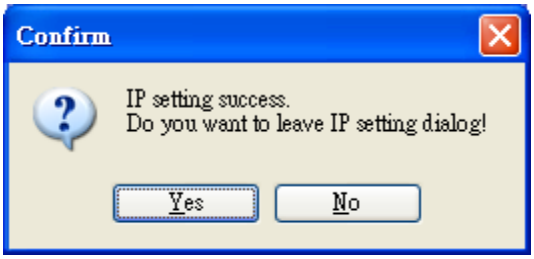
Step 5: Select “IP setting” button from the toolbar



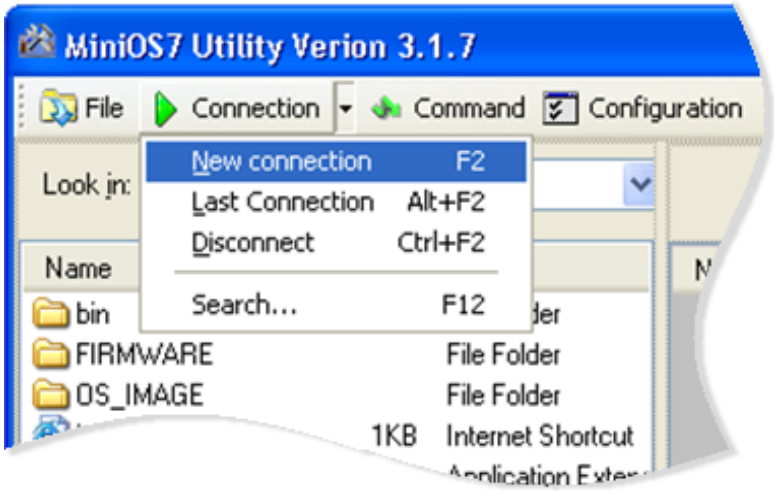
Step 6: On the “IP Setting” dialog, set the “IP” settings and then click the “Set” button



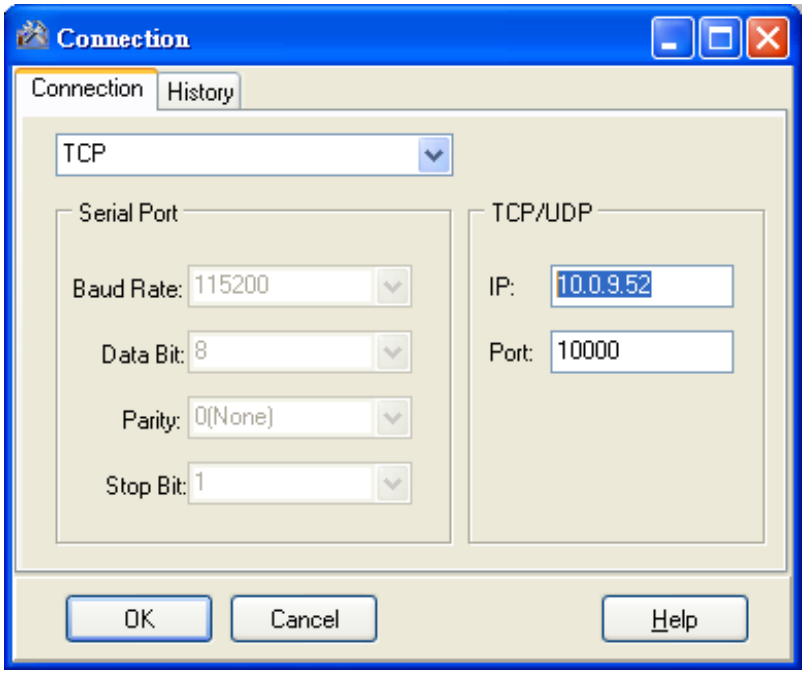
Step 7: On the “Confirm” dialog, click the “Yes” button to exit



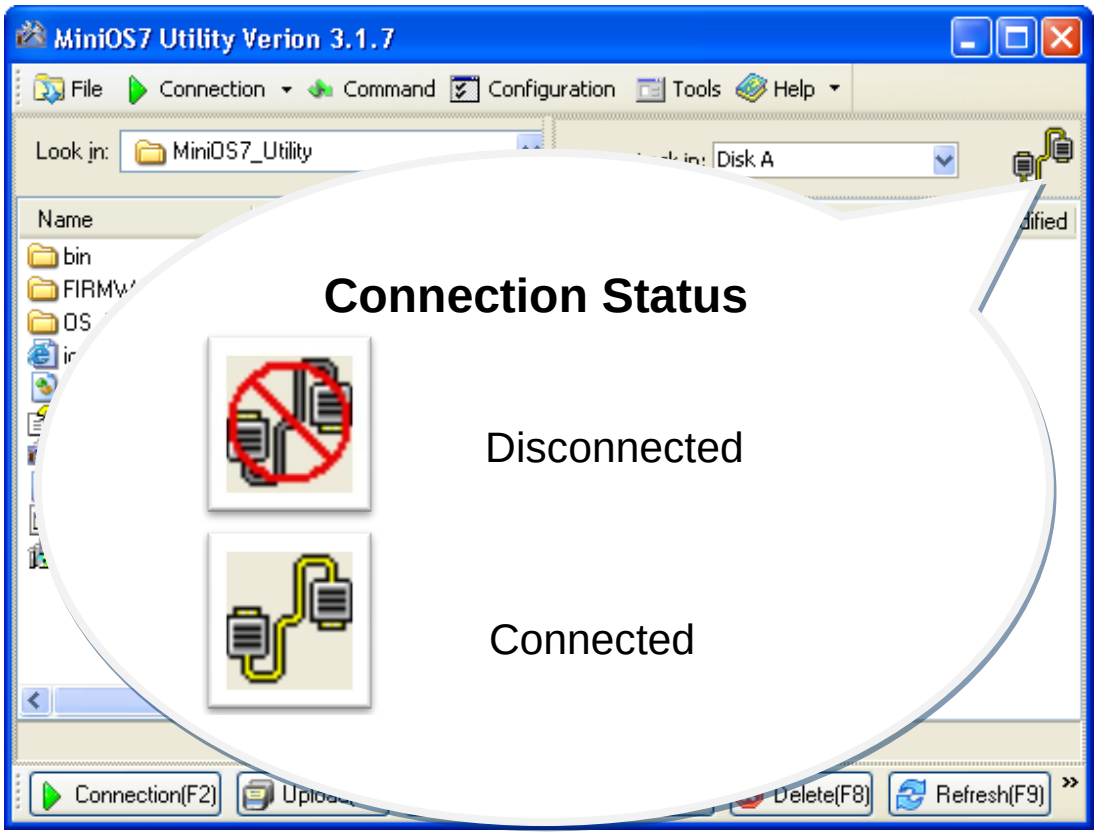
Step 8: Click the “New connection” from the “Connection” menu



Step 9: On the “Connection” dialog box, select “TCP” from the drop down list and enter the “IP” which just assigns

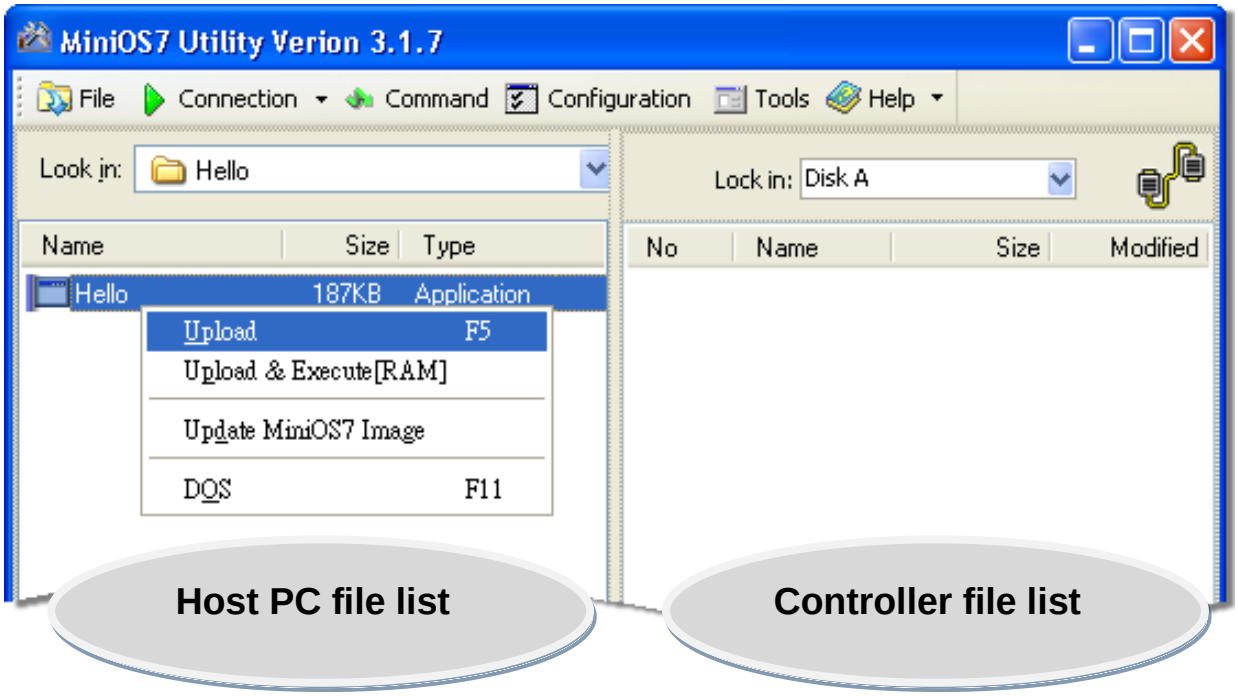


Step 10: The connection has already established

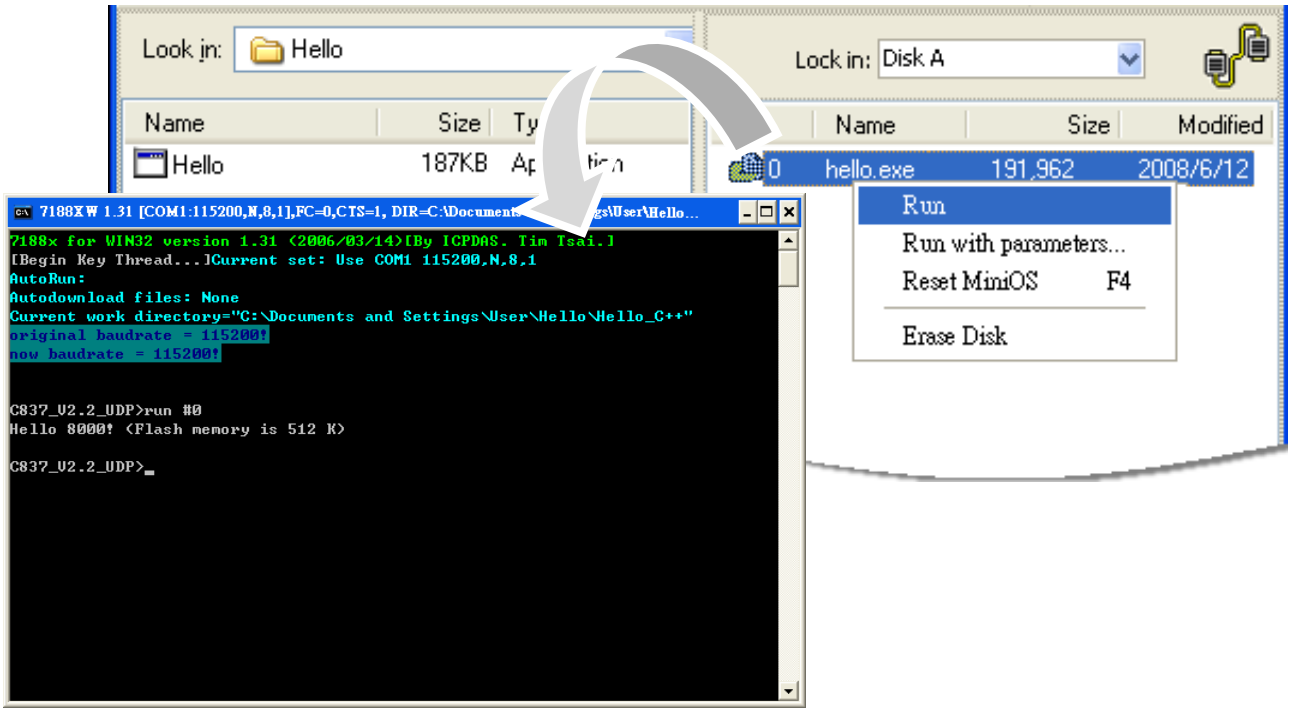


2.3.2. Uploading and executing programs on uPAC-7186EX

Step 1: On the host pc file list, Right click on the file name that you wish to download and then select the “Upload” option



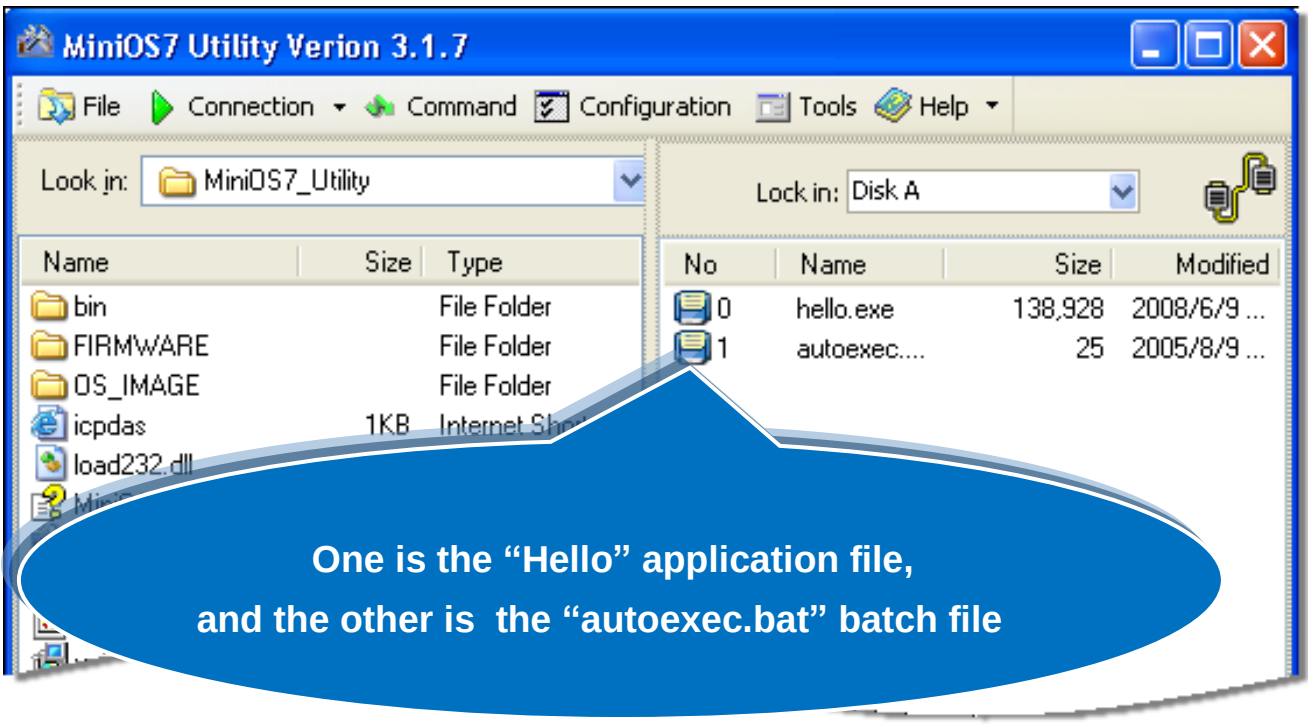
Step 2: On the controller file list, Right click on the file name that you wish to execute and then select the “Run” option

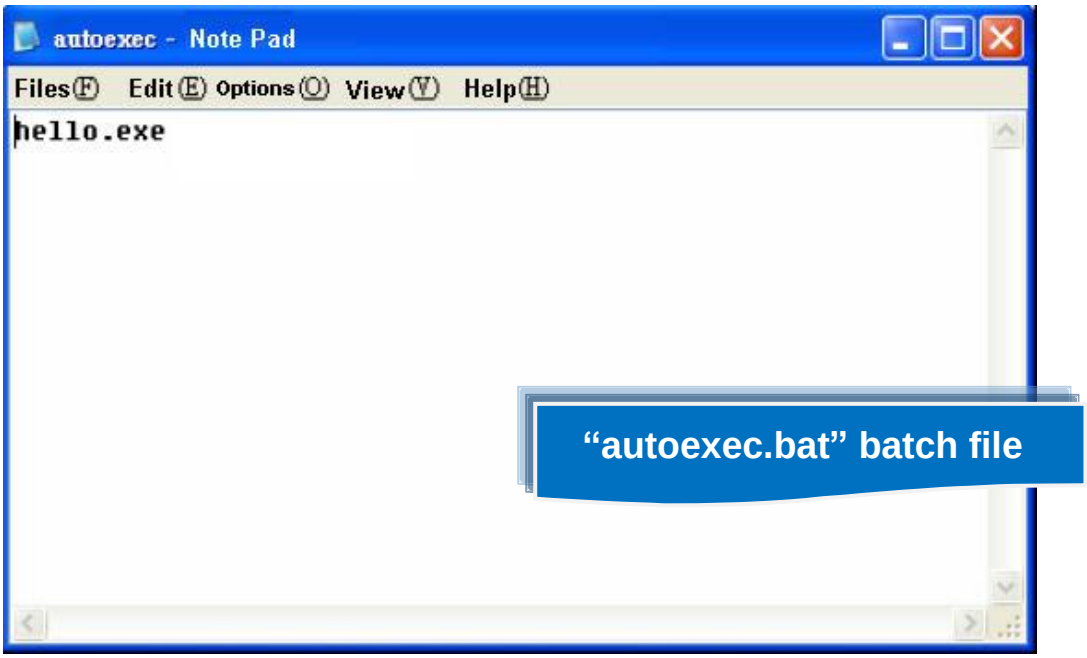


2.3.3. Making programs start automatically

After download programs on the uPAC-7186EX, if you need programs to start automatically after the uPAC-7186EX start-up, it is easy to achieve it, to create a batch file called autoexec.bat and then upload it on the uPAC-7186EX, the program will start automatically in the next start-up.

For example, to make the program “hello” run on start-up.





2.4. MiniOS7 Utility for updating OS image

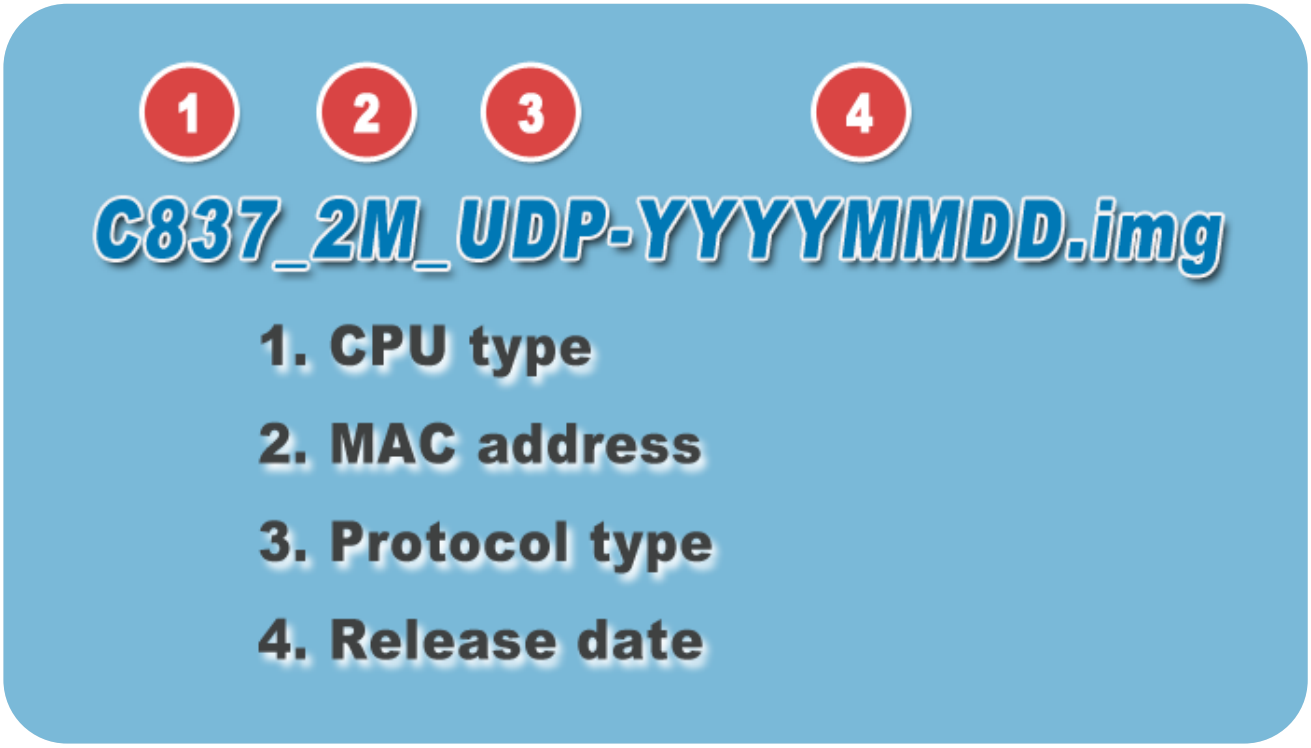
ICP DAS will continue to add additional features to MiniOS7 in the future, we advise you periodically check the ICP DAS web site for the latest update to MiniOS7.

Step 1: Get the latest version of the MiniOS7 OS image

The latest version of the MiniOS7 OS image can be obtain from:

CD:\ NAPDOS\7186e\OS_Image

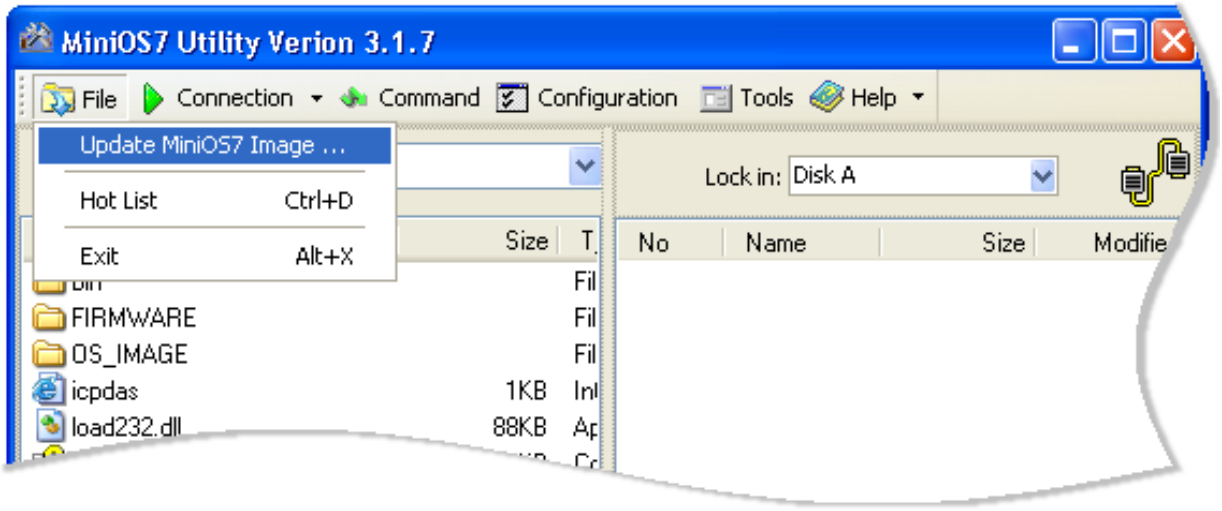
http://ftp.icpdas.com/pub/cd/8000cd/napdos/7186e/OS_Image/



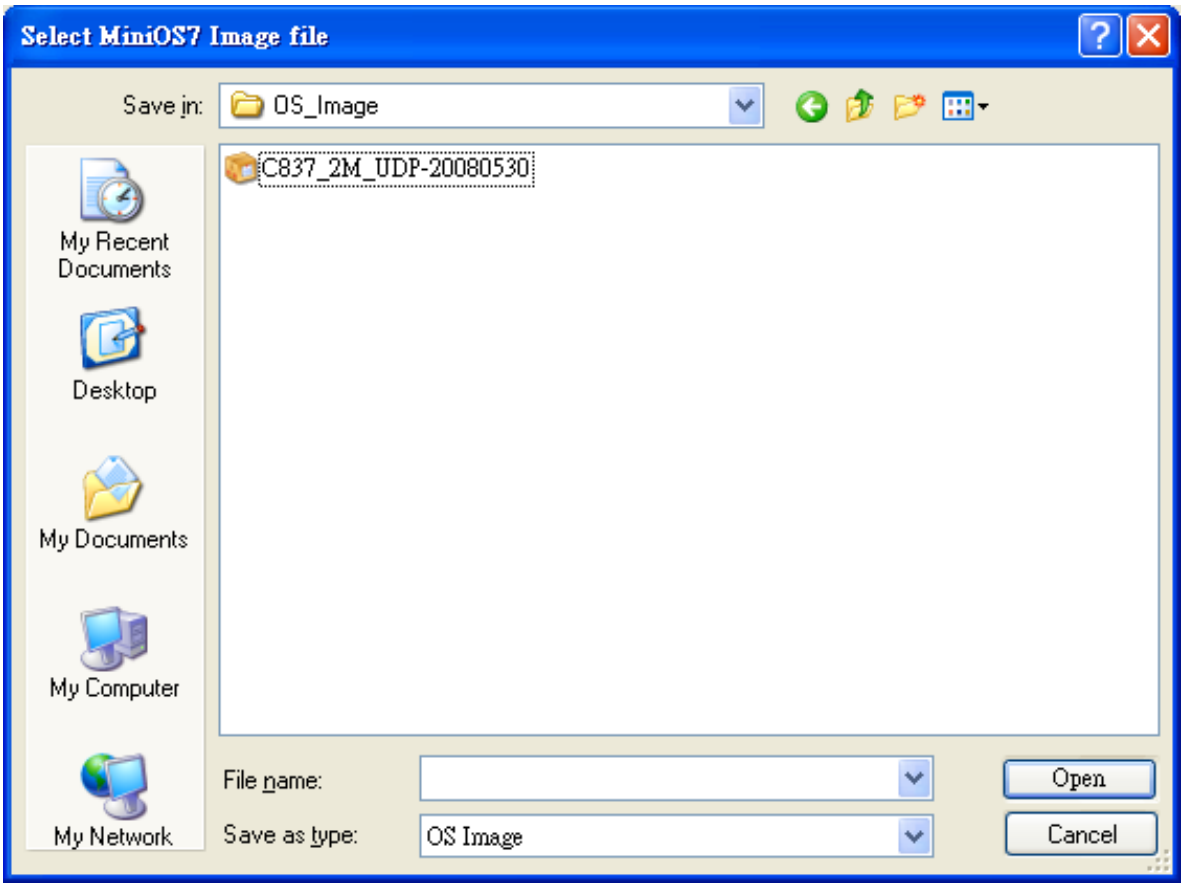
Step 2: Establish a connection

For more detailed information about this process, please refer to section "2.3.1. Establishing a connection".

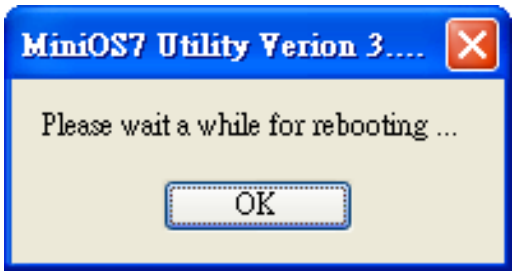
Step 3: Click on the "Update MiniOS7 Image …" from the "File" menu



Step 4: Select the latest version of the MiniOS7 OS image



Step 5: Click on the “Update MiniOS7 Image …” from the “File” menu



Step 6: Click on the “Info” buttion to check OS image version

3. Your First Program on uPAC-7186EX

Before writing your first program, ensure that you have the necessary C/C++ compiler and the corresponding functions library on your system.

3.1. Setting up the compiler

The following compilers are available for uPAC-7186EX.

- Turbo C++ Version 1.01 (Freeware)
- Turbo C Version 2.01 (Freeware)
- Borland C++ Versions 3.1 - 5.2.x
- MSC
- MSVC ++

ICP DAS suggests that the Borland C++ version compiler is used as the libraries provided on the companion CD have been created using this compiler.

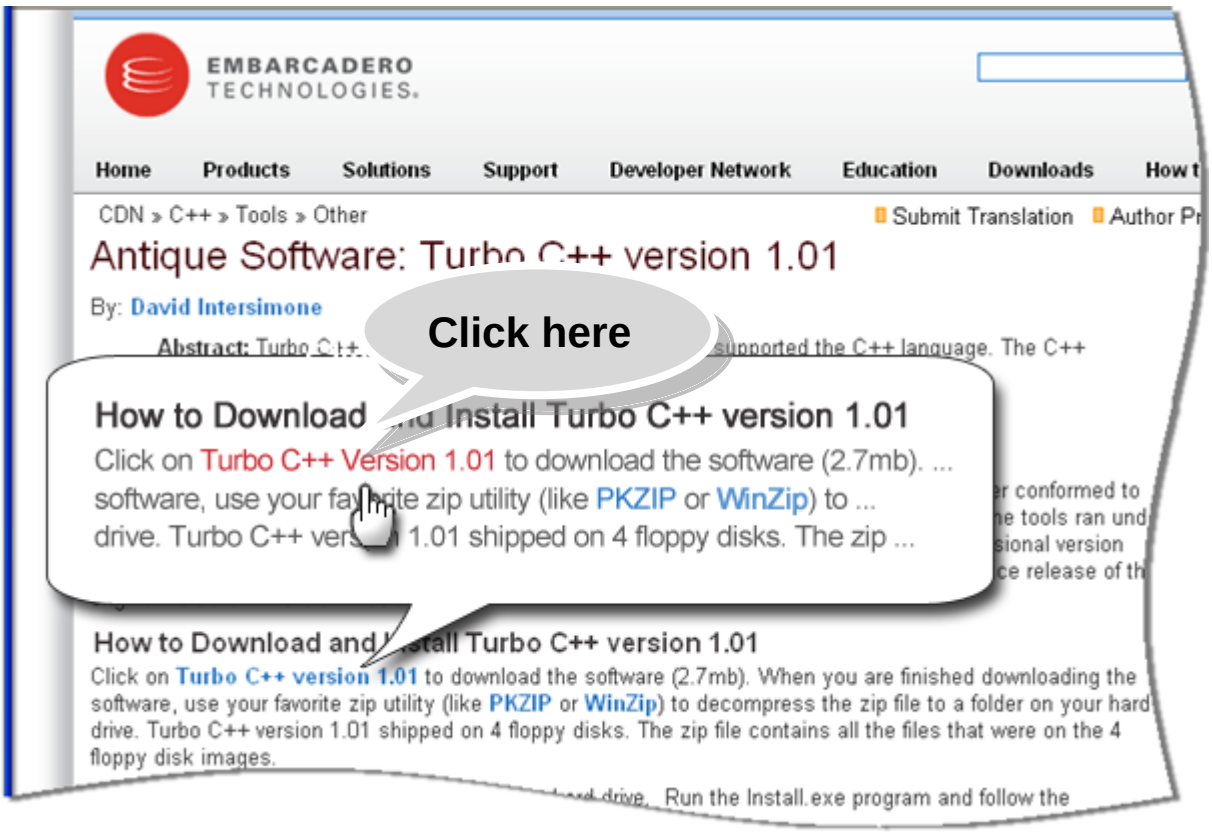
Special attention should be paid to the following items before using the compiler to develop custom applications:

- Generate a standard DOS executable program
- Set the CPU option to 80188/80186
- Set the floating point option to EMULATION if floating point computation is required. (Be sure not to choose 8087)
- Cancel the Debug Information function as this helps to reduce program size. (MiniOS7 supports this feature.).

3.1.1. Installing the Compiler

If there is no compiler currently installed on your system, installation of the compiler should be the first step. The following section guides you to install Turbo C++ Version 1.01 on your system.

Step 1: Go to the Borland web site and download Turbo C++ version 1.01



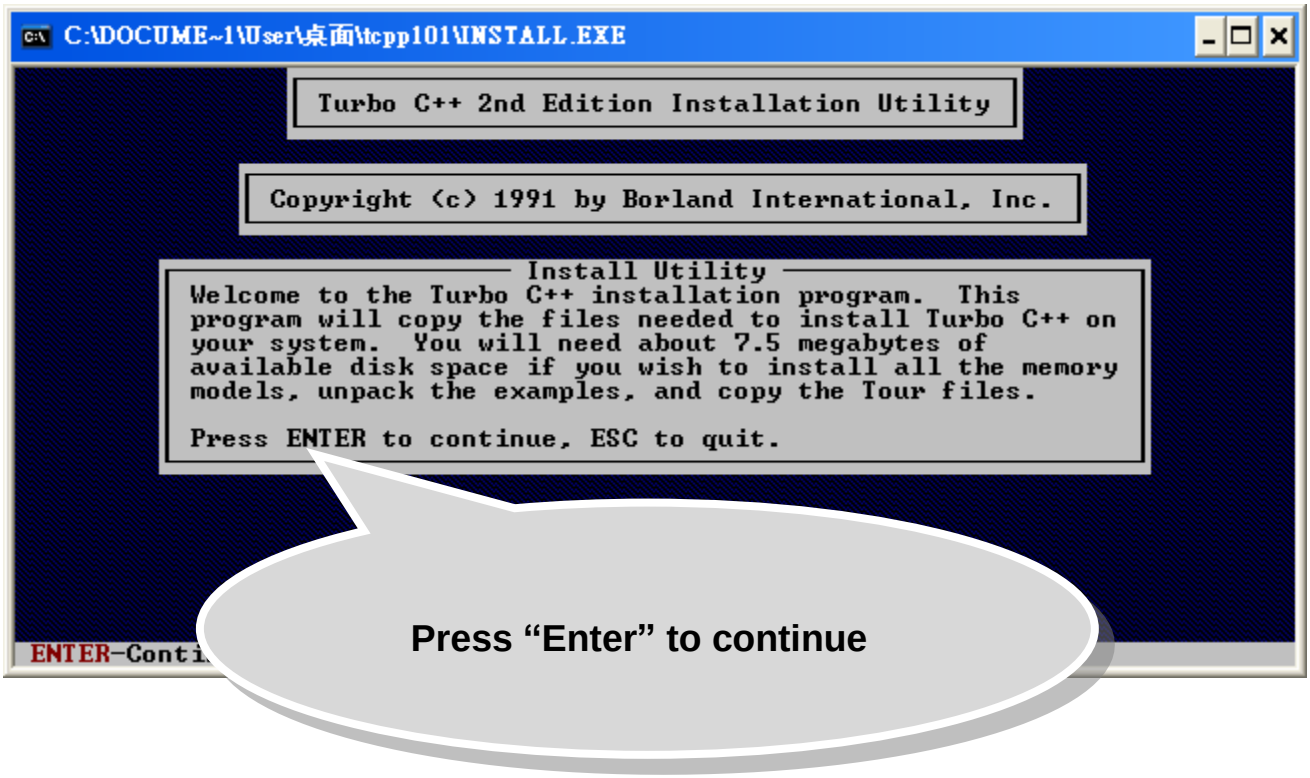
Free versions of the Turbo C++ version 1.01 and Turbo version 2.01 Compilers can be downloaded from the Borland web site.

- Turbo C++ version 1.01
  http://dn.codegear.com/article/21751
- Turbo C version 2.01
  http://dn.codegear.com/article/20841

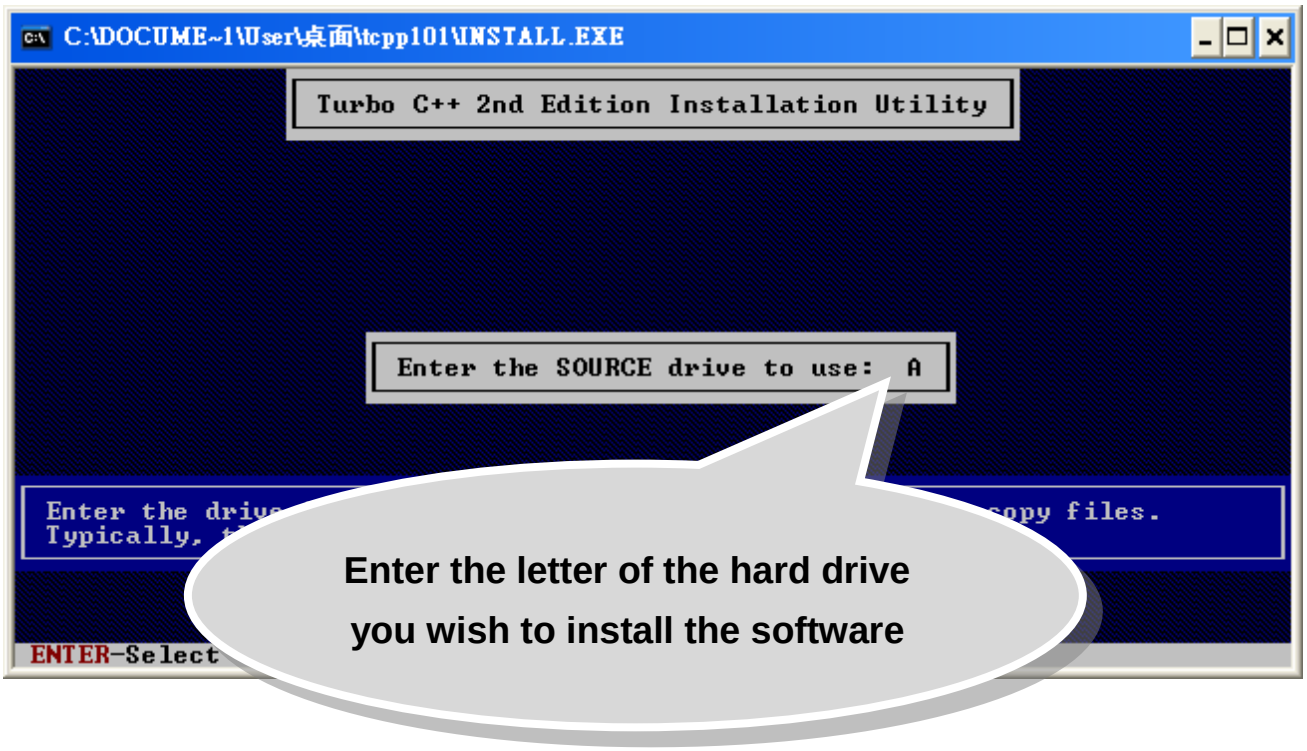
Step 2: Unzip the downloaded zip file to the temporary folder

Step 3: Double click the executable file to start setup wizard

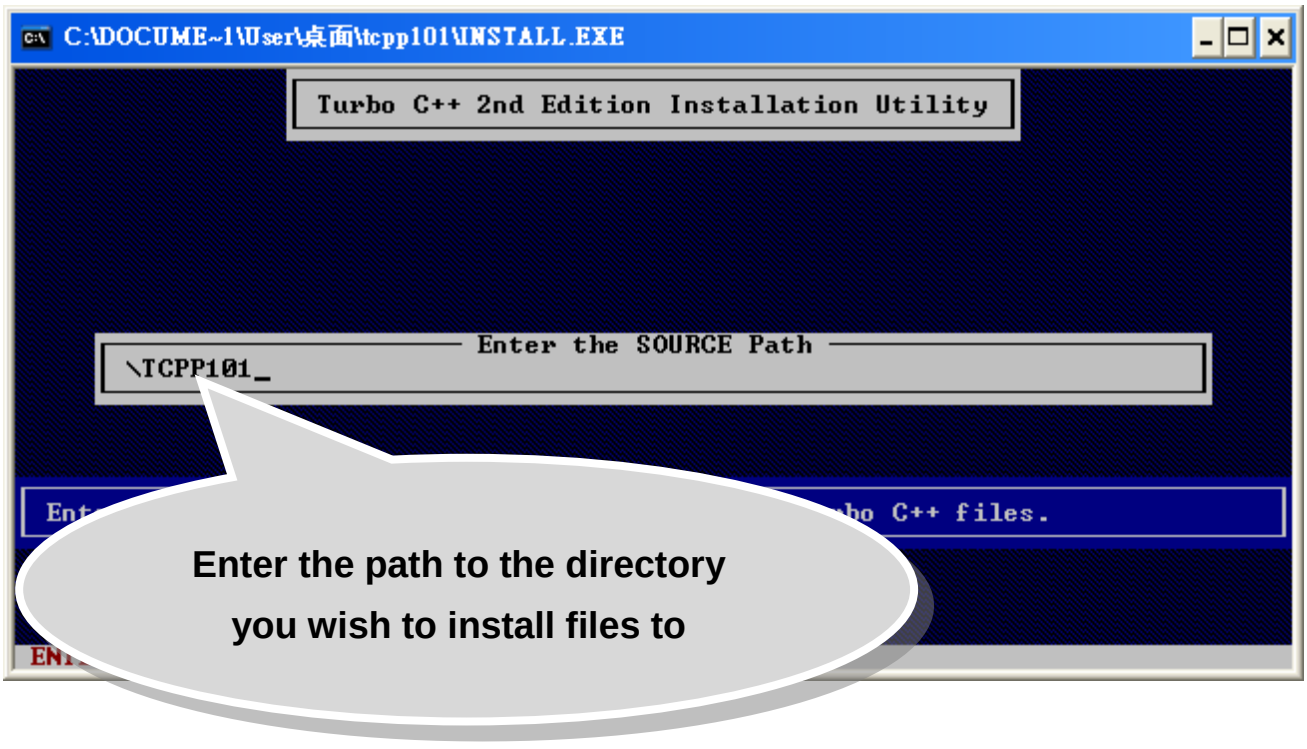
Step 4: Press “Enter” to continue



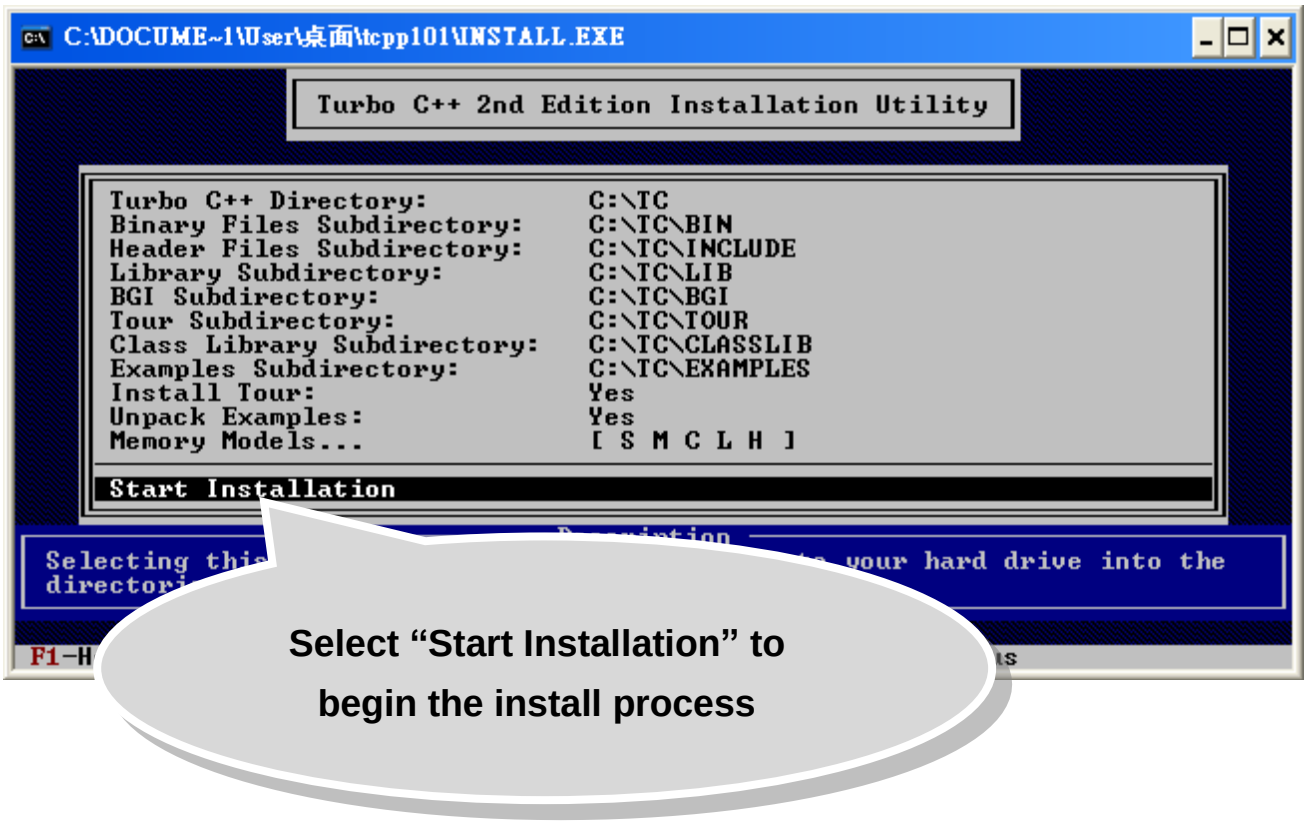
Step 5: Enter the letter of the hard drive you wish to install the software



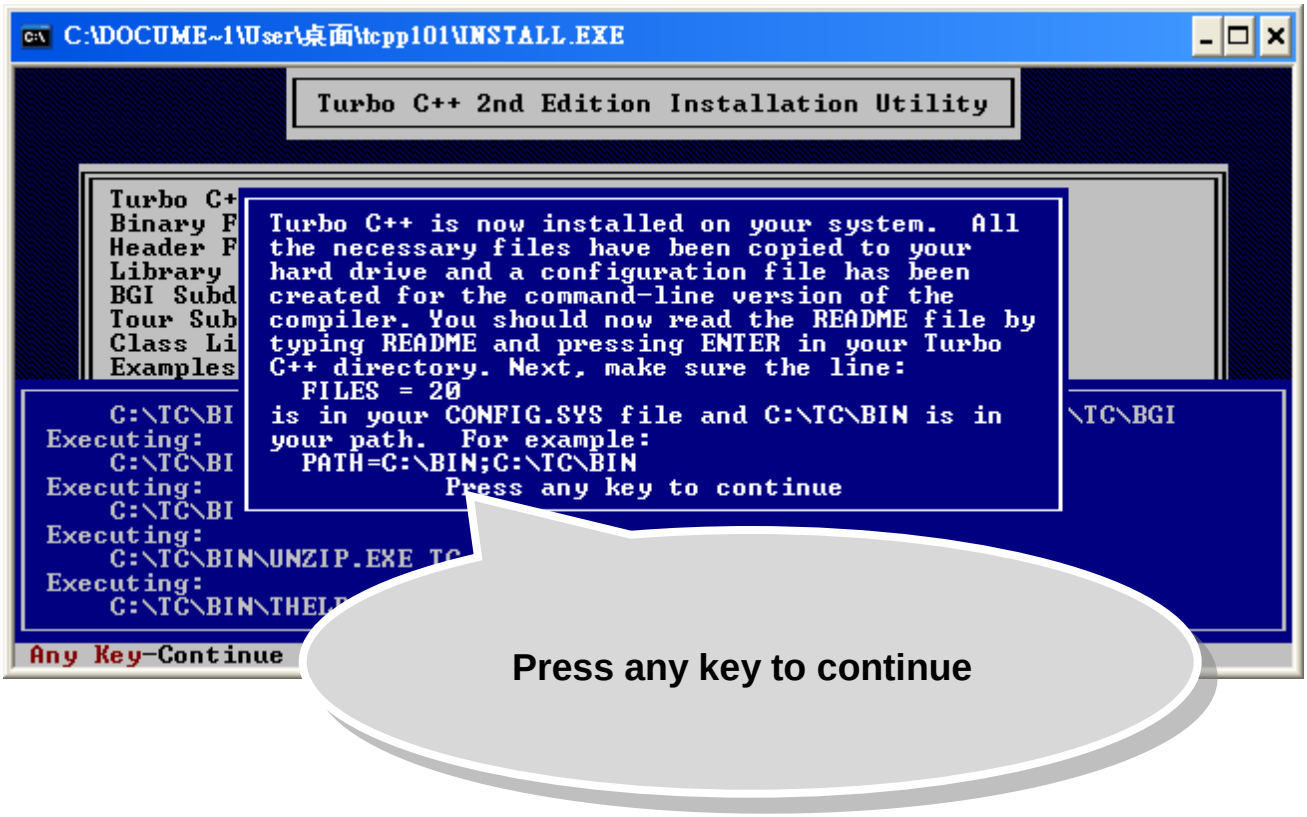
Step 6: Enter the path to the directory you wish to install files to



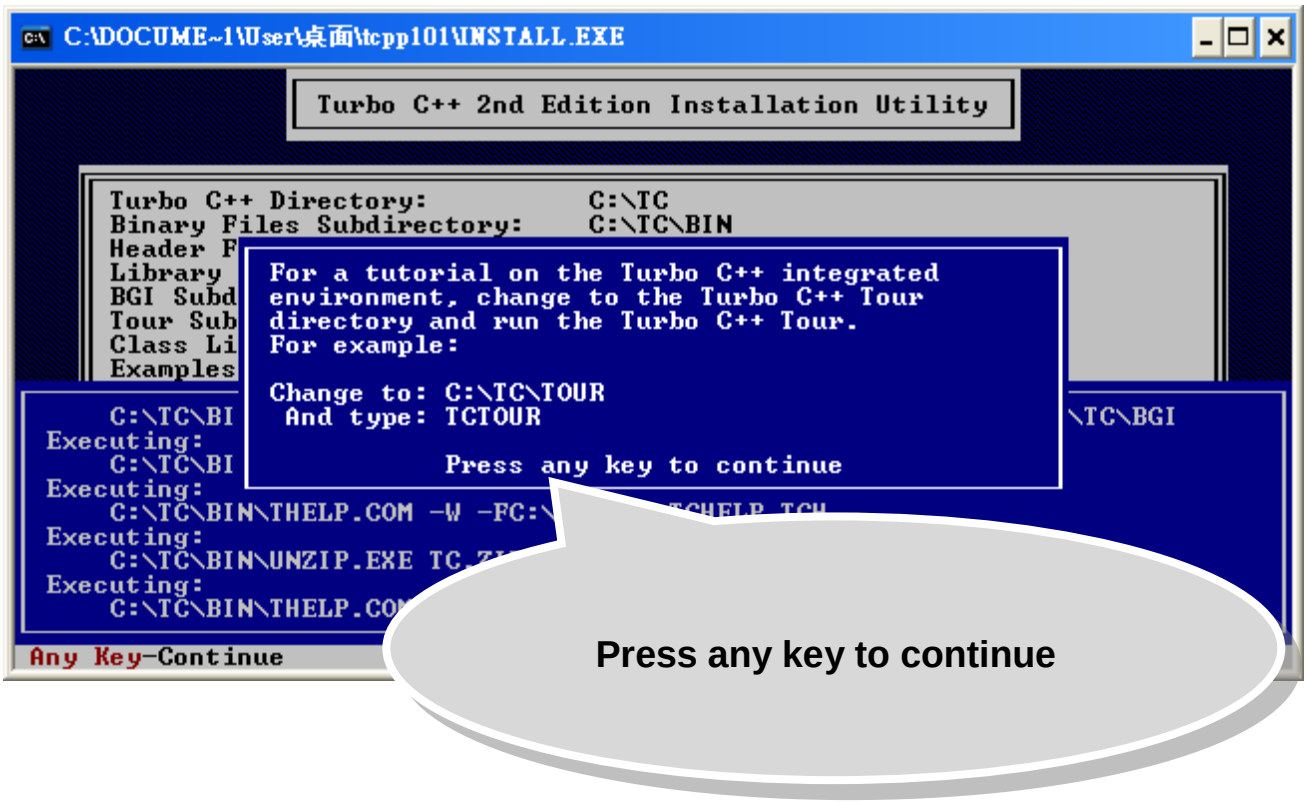
Step 7: Select “Start Installation” to begin the install process



Step 8: Press any key to continue



Step 9: Press any key to continue

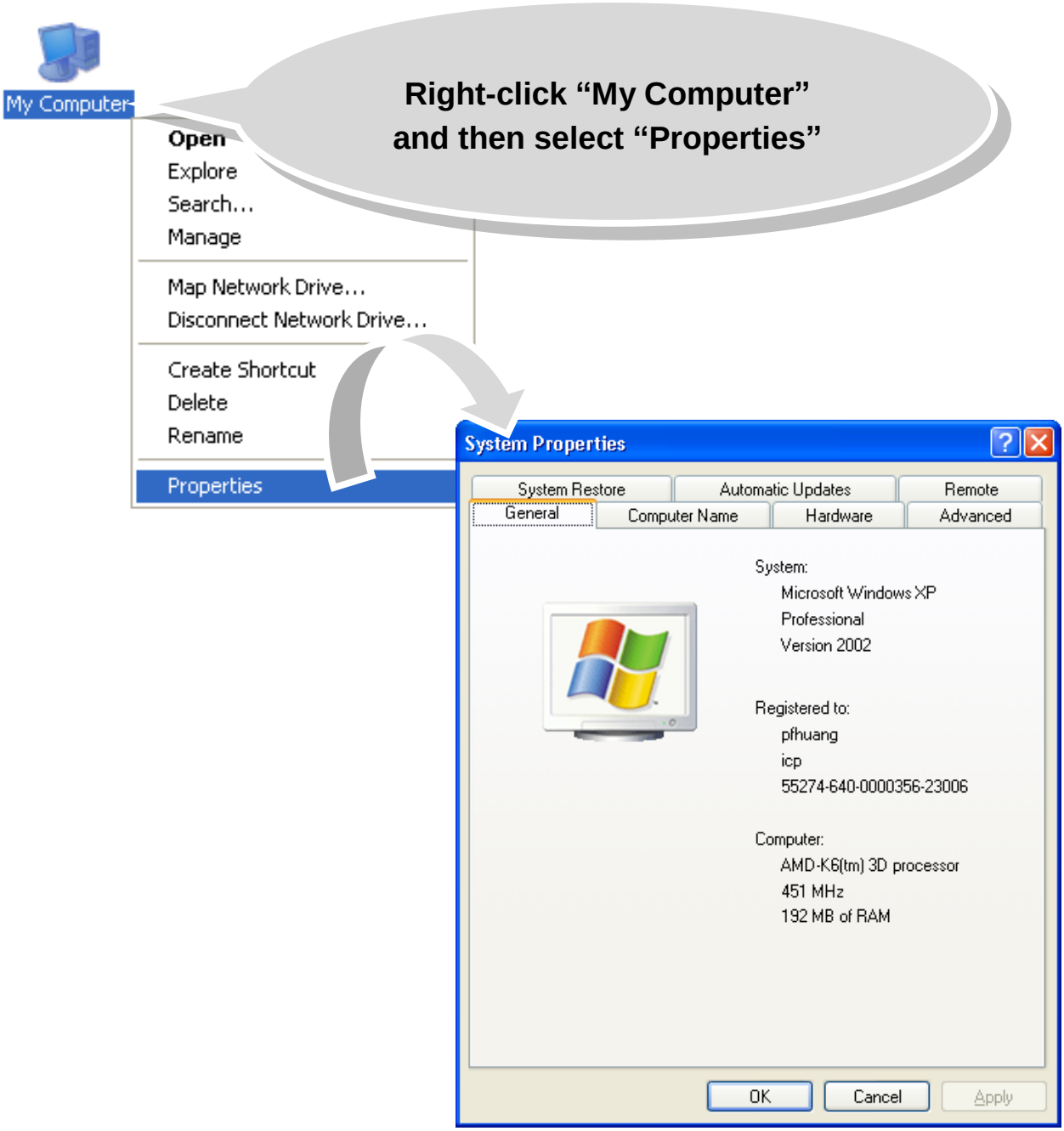


Step 10: Installation is complete

3.1.2. Setting up the environment variables

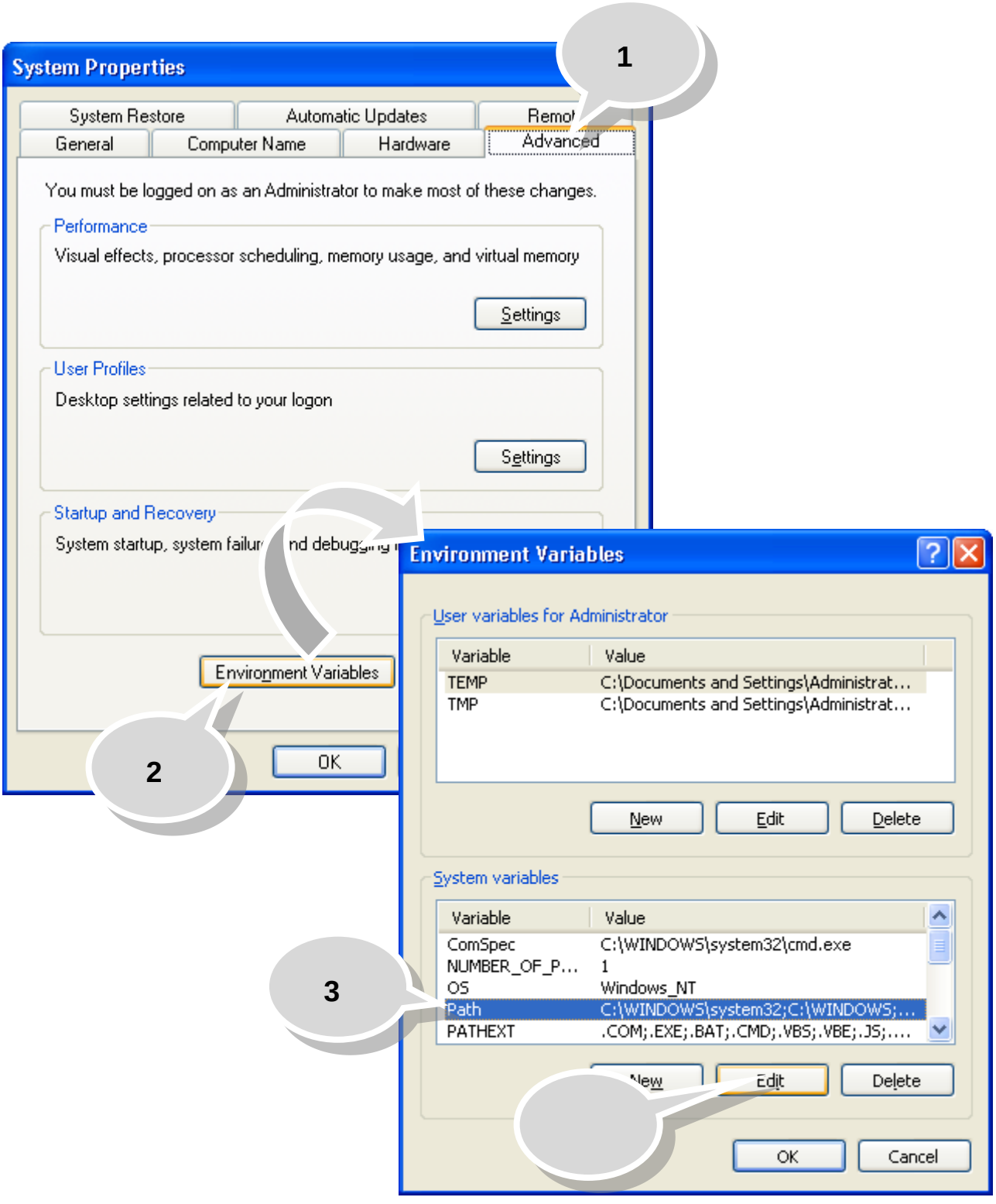
After installing the compiler, several compilers will be available from the Windows Command line. You can set the path environment variable so that you can execute This compiler on the command line by entering simple names, rather than by using Their full path names.

Step 1: Right click on the "My Computer" icon on your desktop and select the "Properties" menu option



Step 2: On the "System Properties" dialog box, click the "Environment Variables" button located under the "Advanced" sheet

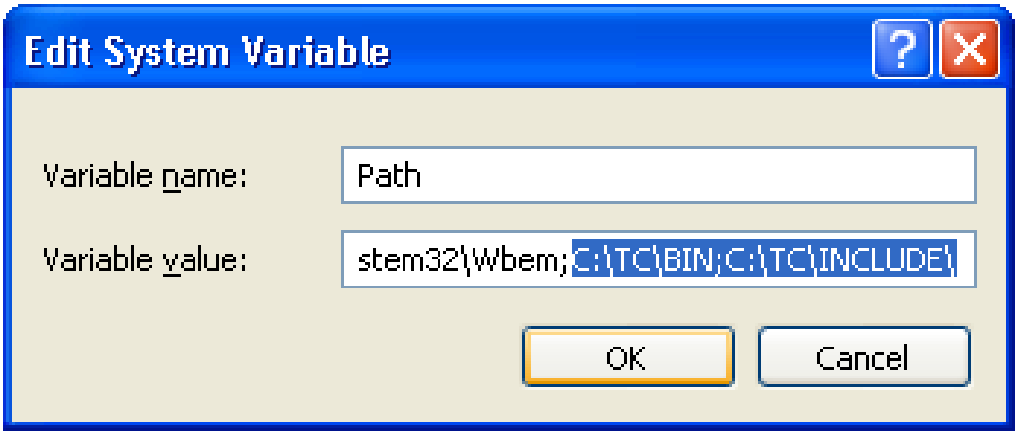
Step 3: On the "Environment Variables" dialog box, click the "Edit" button located in the "System variables" option



Step 4: Add the target directory to the end of the variable value field

A semi-colon is used as the separator between variable values.

For example, ”;c:\TC\BIN\;c:\TC\INCLUDE\”



Step 5: Restart the computer to allow your changes to take effect

3.2. API for uPAC-7186EX

To develop a custom program, ensure that the files below are installed the Host PC. If they are not installed, refer to “section **2.2. Software Installation**”.

- **Functions Library ─ 7186e.lib**

  This file contains the MiniOS7 API (Application Programming Interface) and has hundreds of pre-defined functions related to your controller.

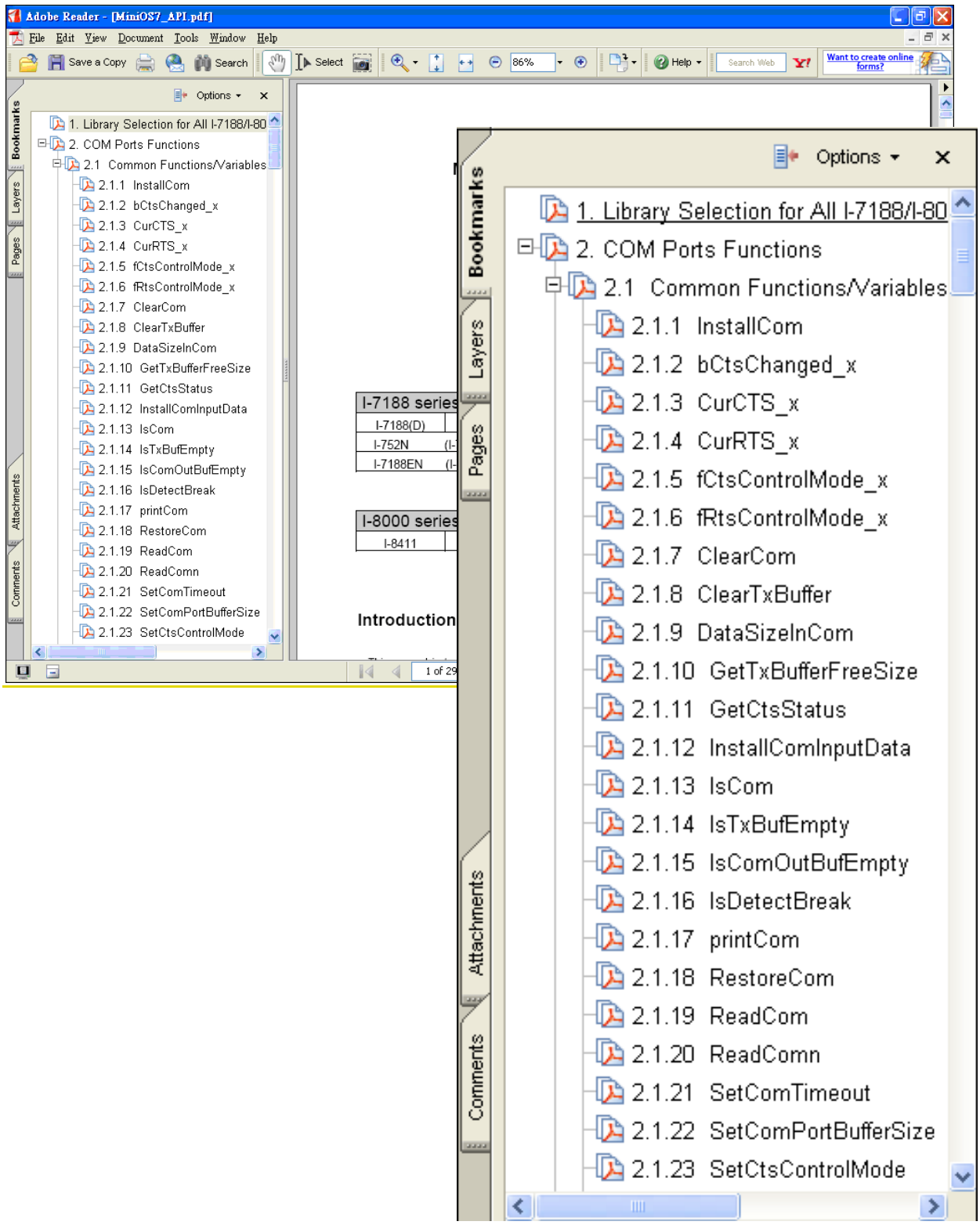
- **Header File ─ 7186e.h**

  This file contains the forward declarations of subroutines, variables, and other identifiers used for the MiniOS7 API.

For full usage information regarding the description, prototype and the arguments of the functions, please refer to the “MiniOS7 API Functions User Manual” located at:

CD:\Napdos\MiniOS7\Document

http://ftp.icpdas.com/pub/cd/8000cd/napdos/minios7/document/



3.3. Build and run your first program

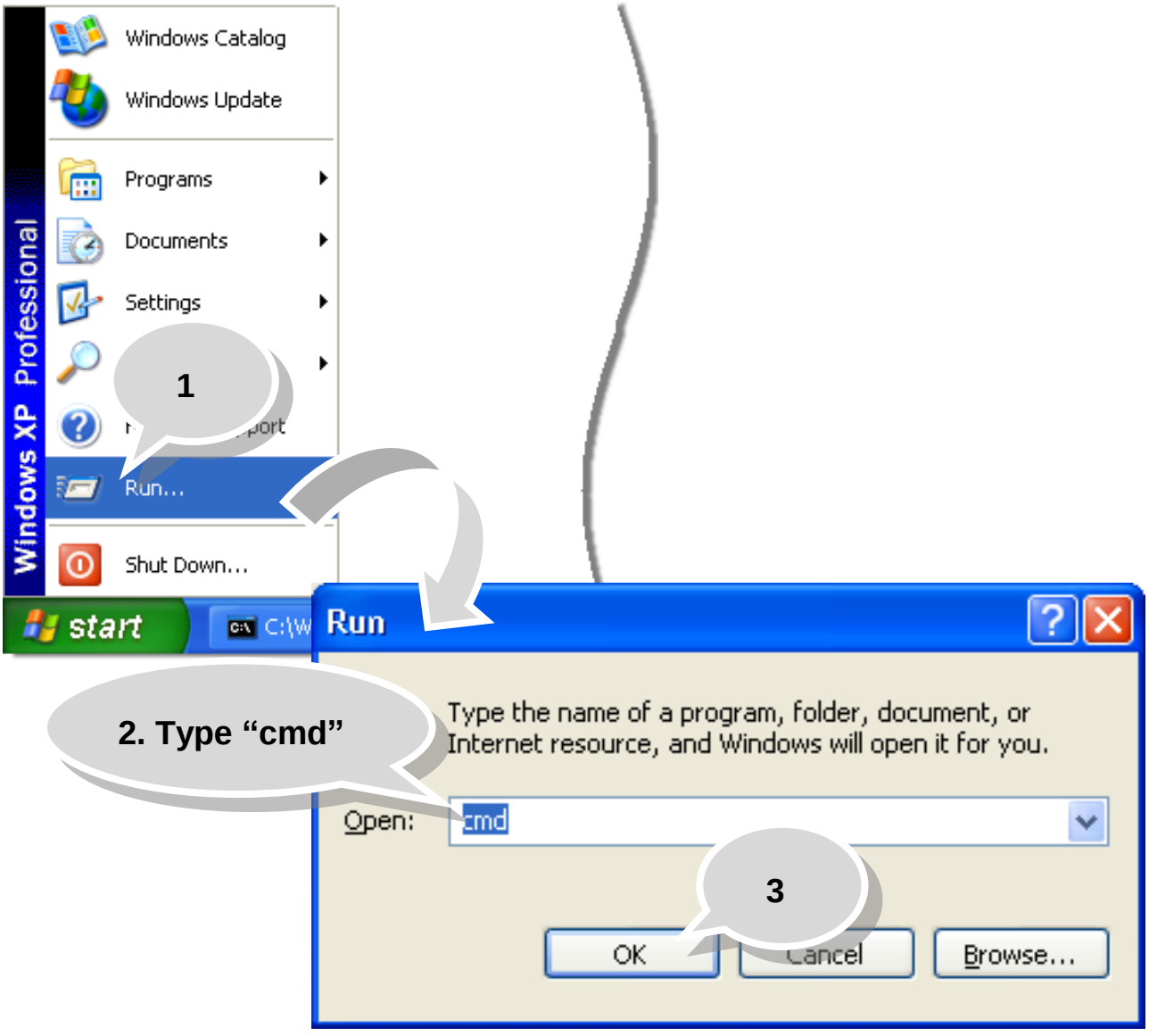
If you don't using the TC++ (Turbo C++) to write a program, please take the following steps.

Step 1: Open a MS-DOS command prompt

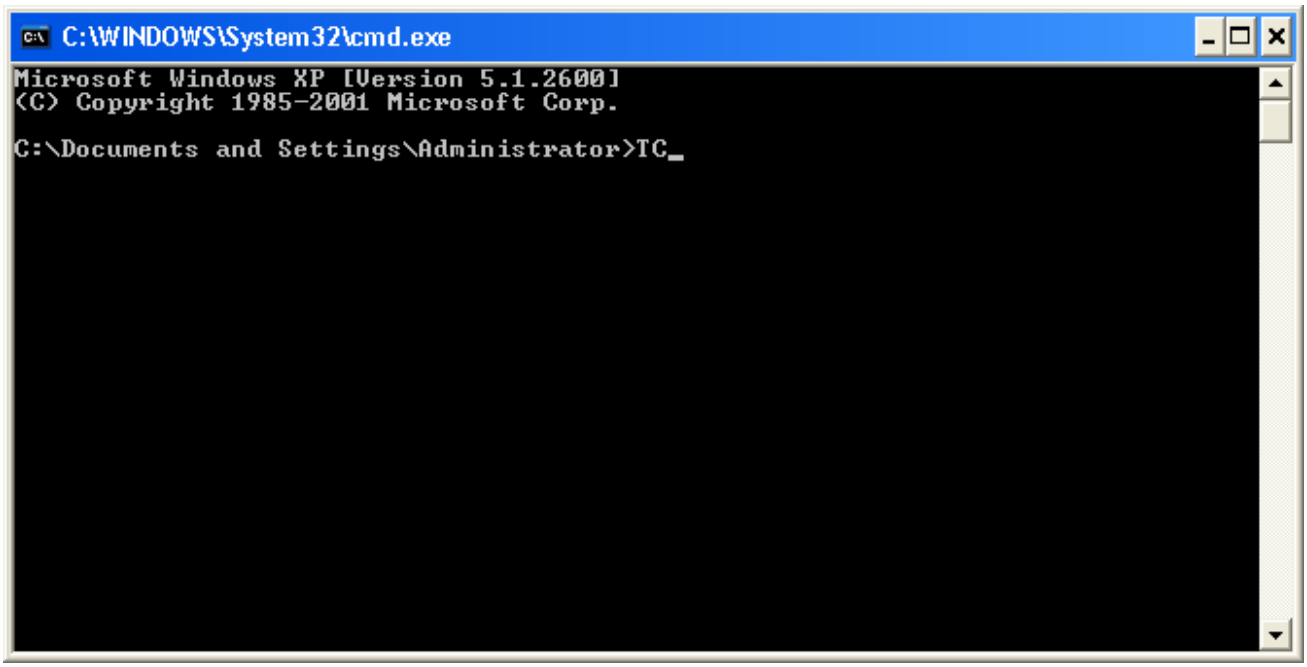
i. Select "Run" from the "Start" menu

ii. On the "Run" dialog box, type "cmd"

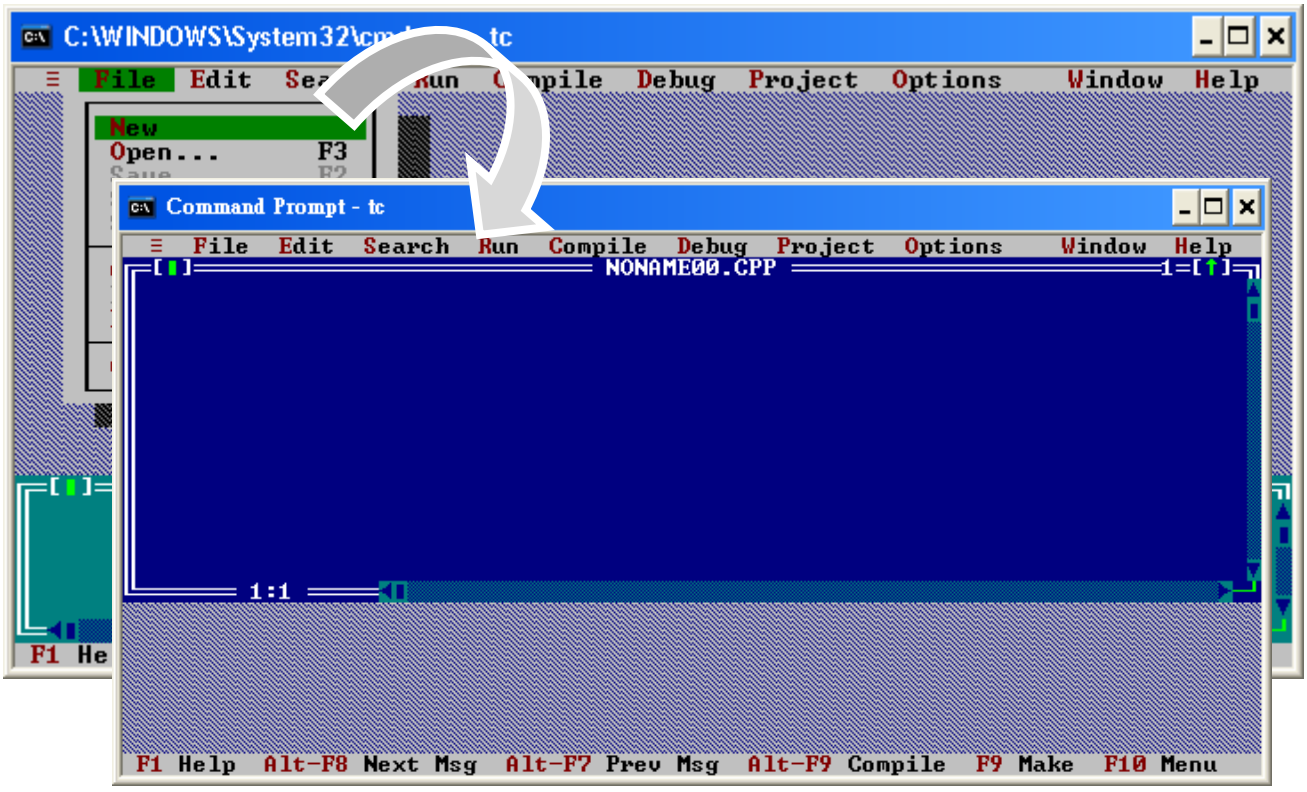
iii. click the "OK" button



Step 2: At the command prompt, type “TC” and then press “Enter”



Step 3: Select “New” from the “File” menu to create a new source file



Step 4: Type the following code. Note that the code is case-sensitive

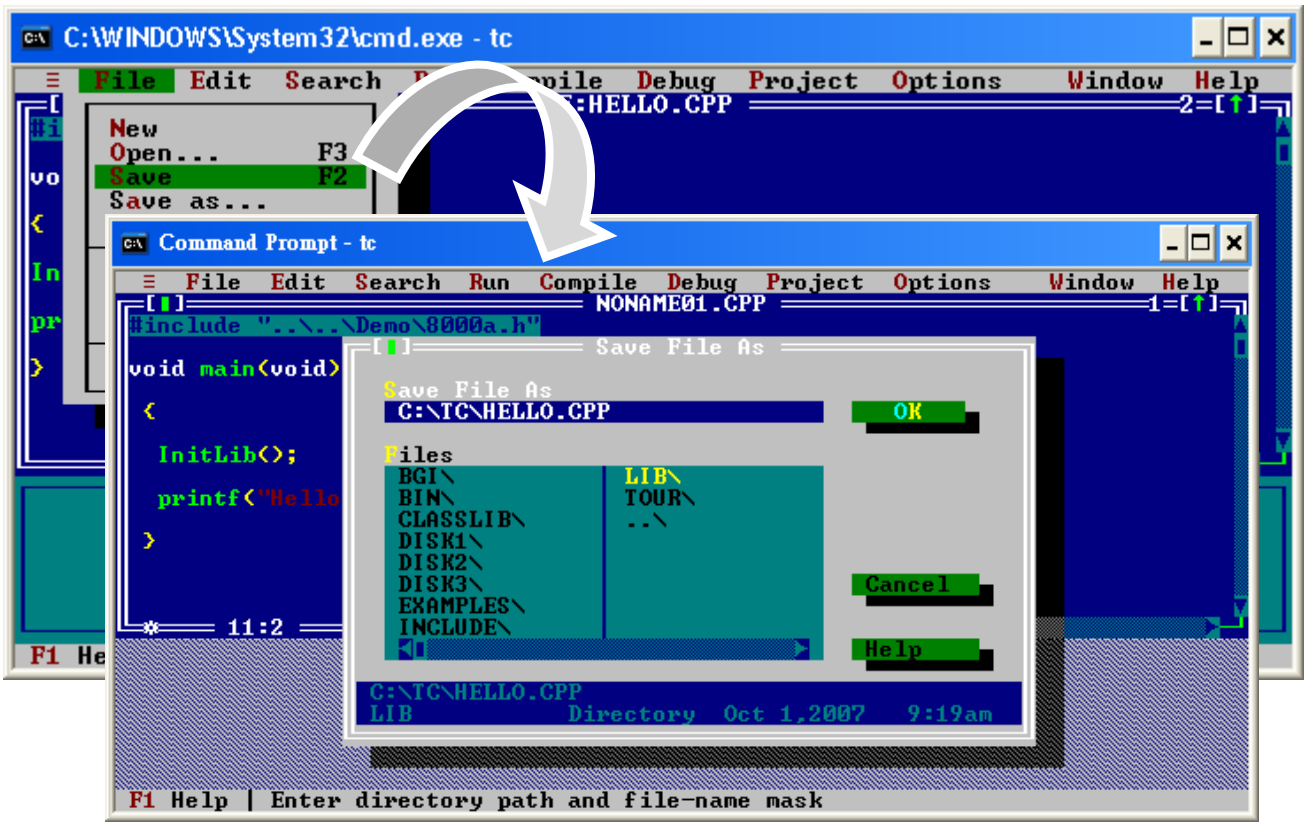
```
#include “7186e.h”
/* Include the header file that allows 8000e.lib functions to be used */
void main(void)
{
InitLib();   /* Initiate the 7186e library */

Print(“Hello world!\r\n”);   /* Print the message on the screen */
 }
```

Step 5: Save the source file

i. Select “Save” from the “File” menu

ii. Type the file name “Hello”

iii. Select “OK”



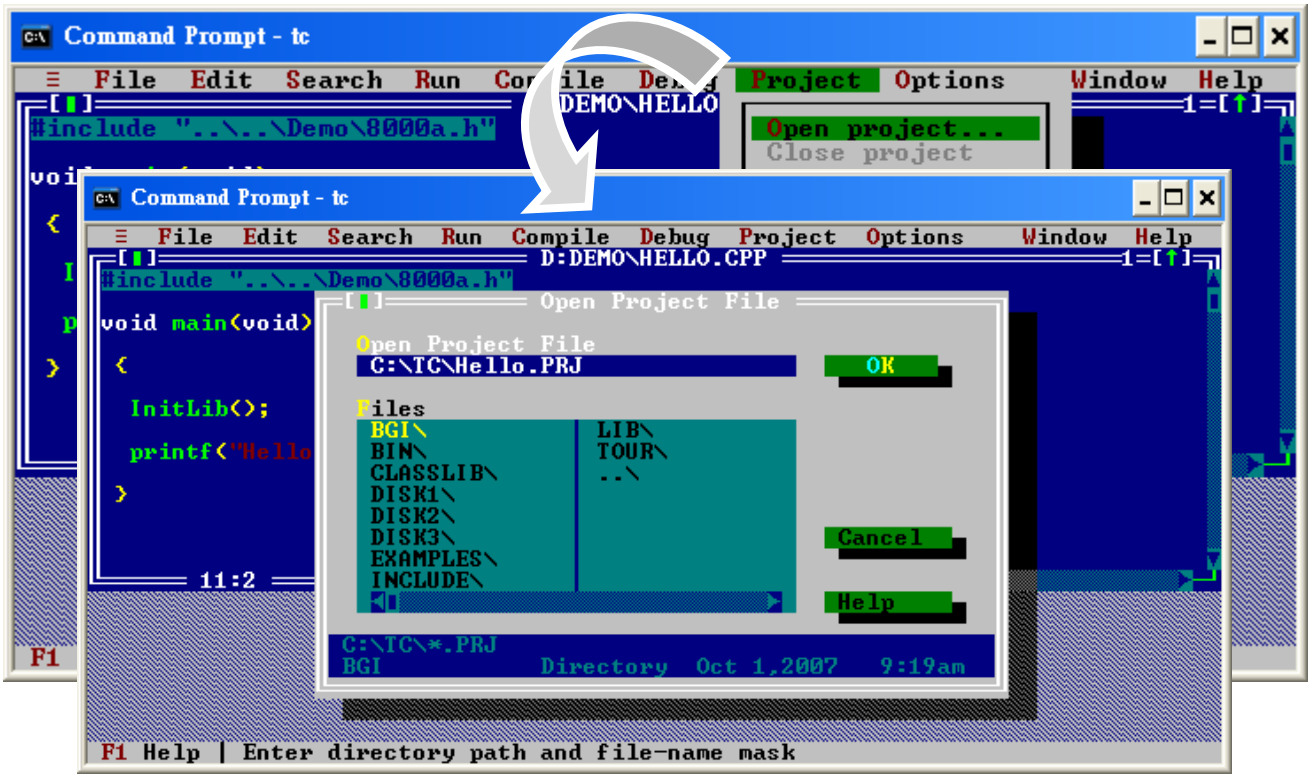
If there is a text editor you are familiar with or prefer to use such as Notepad or edit, you may use it to write the code shown above. It should be noted that a word processor application cannot be used for this purpose, as the application must save the file as plain text. C language program files should always have a ".C" extension name.

Step 6: Create a project (*prj)

i. Select "Open project…" from the "Project" menu

ii. Type the project name "Hello"

iii. Select "OK"



Step 7: Add the necessary source files to the project (*.CPP)

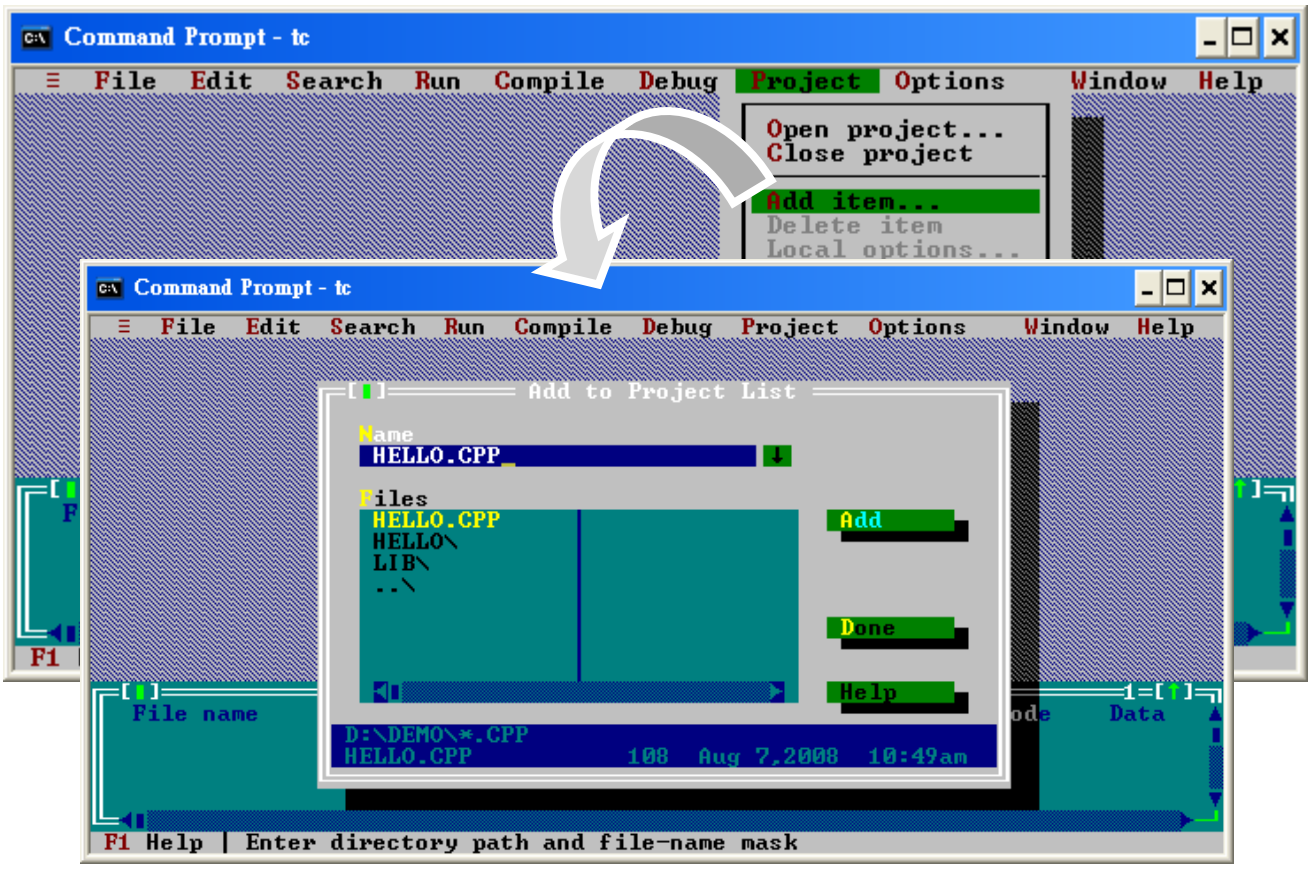
i. Select “Add item…” from the “Project” menu

ii. Type “ *.CPP ” to display a list of all available source files

iii. Choose the source files you require

iv. Select “Add”

v. Select “Done” to exit



Step 8: Add the necessary function libraries to the project (*.lib)

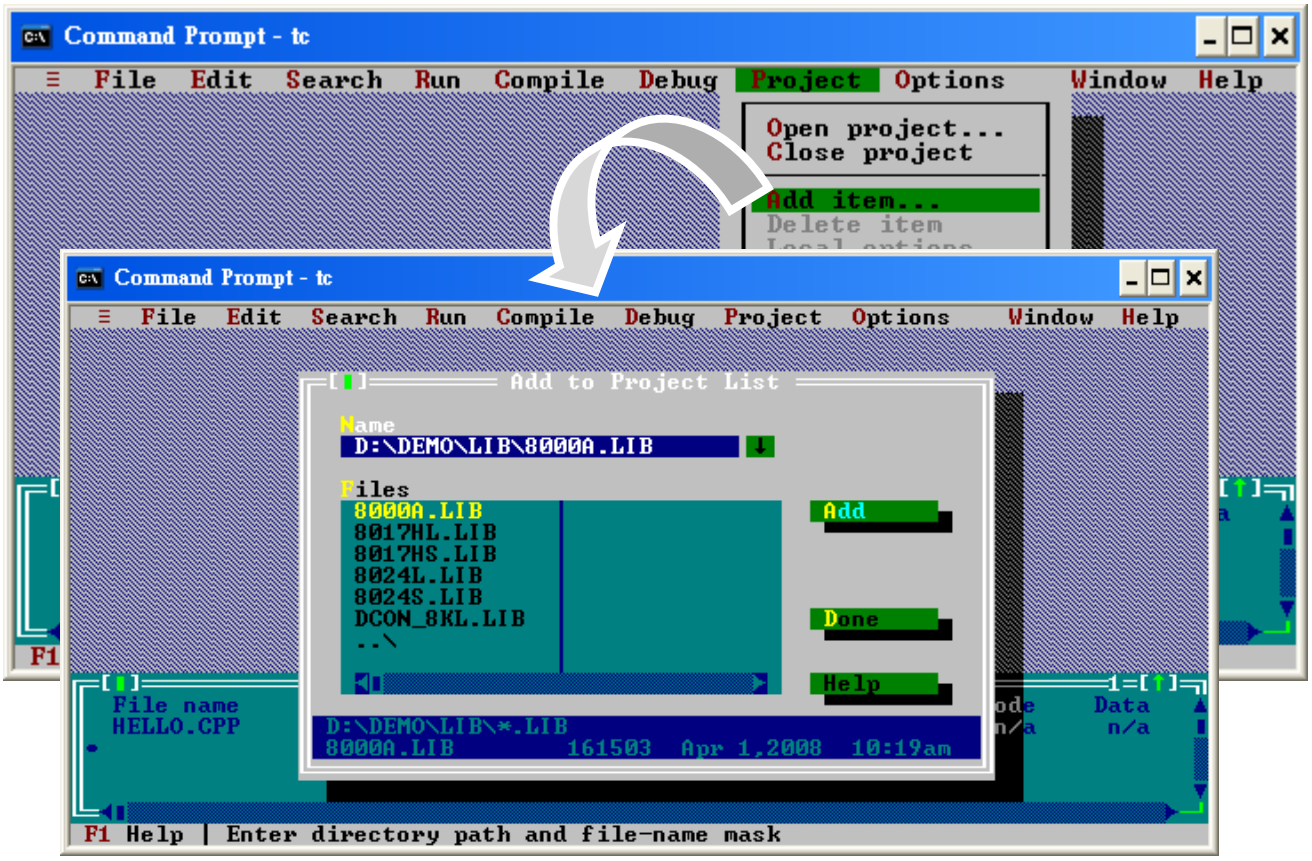
i. Select “Add item…” from the “Project” menu

ii. Type “ *.LIB ” to display a list of all available function libraries

iii. Choose the function libraries you require

iv. Select “Add”

v. Select “Done” to exit

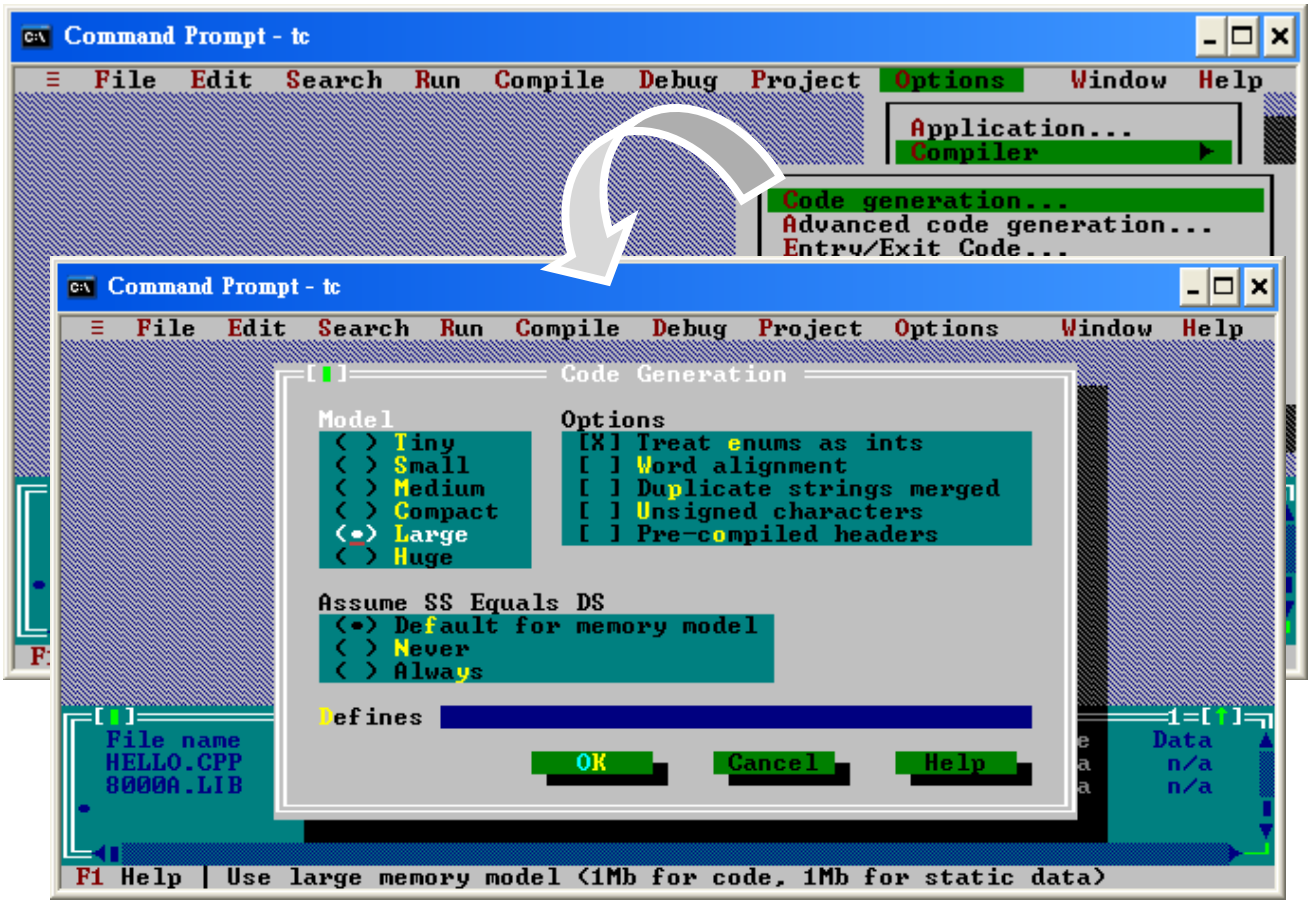


Step 9: Set the memory model to large

i. Select “Compiler” from the “Options” menu and then select “Code generation…”

ii. On “Model” option, select “Large”

iii. Select “OK”



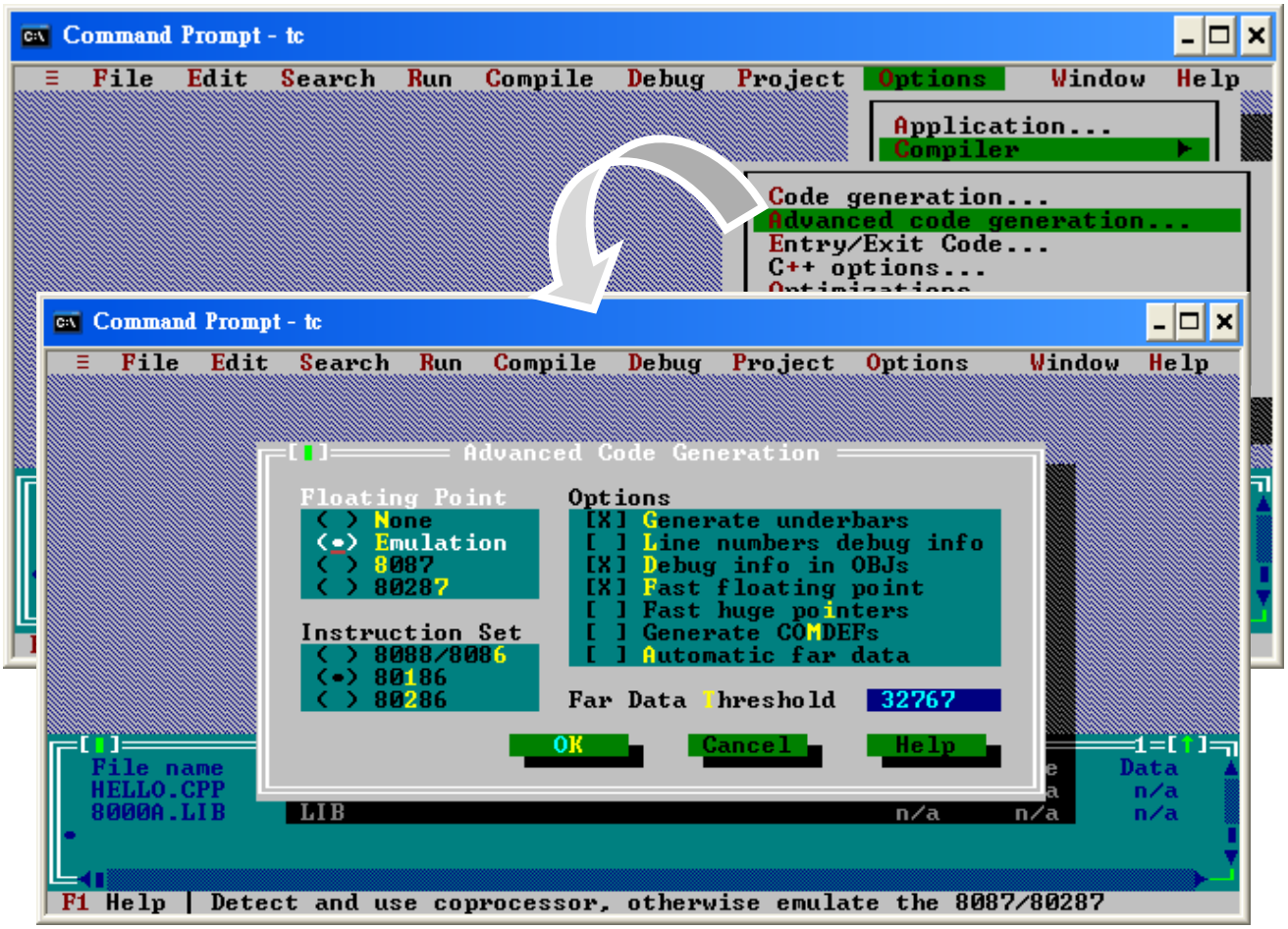
Step 10: Set the memory model to large

i. Select “Compiler” from the “Options” menu and then select “Advanced code generation…”

ii. On “Floating Point” option, select “Emulation”

iii. On “Instruction Set” option, select “80186”

iv. Select “OK”



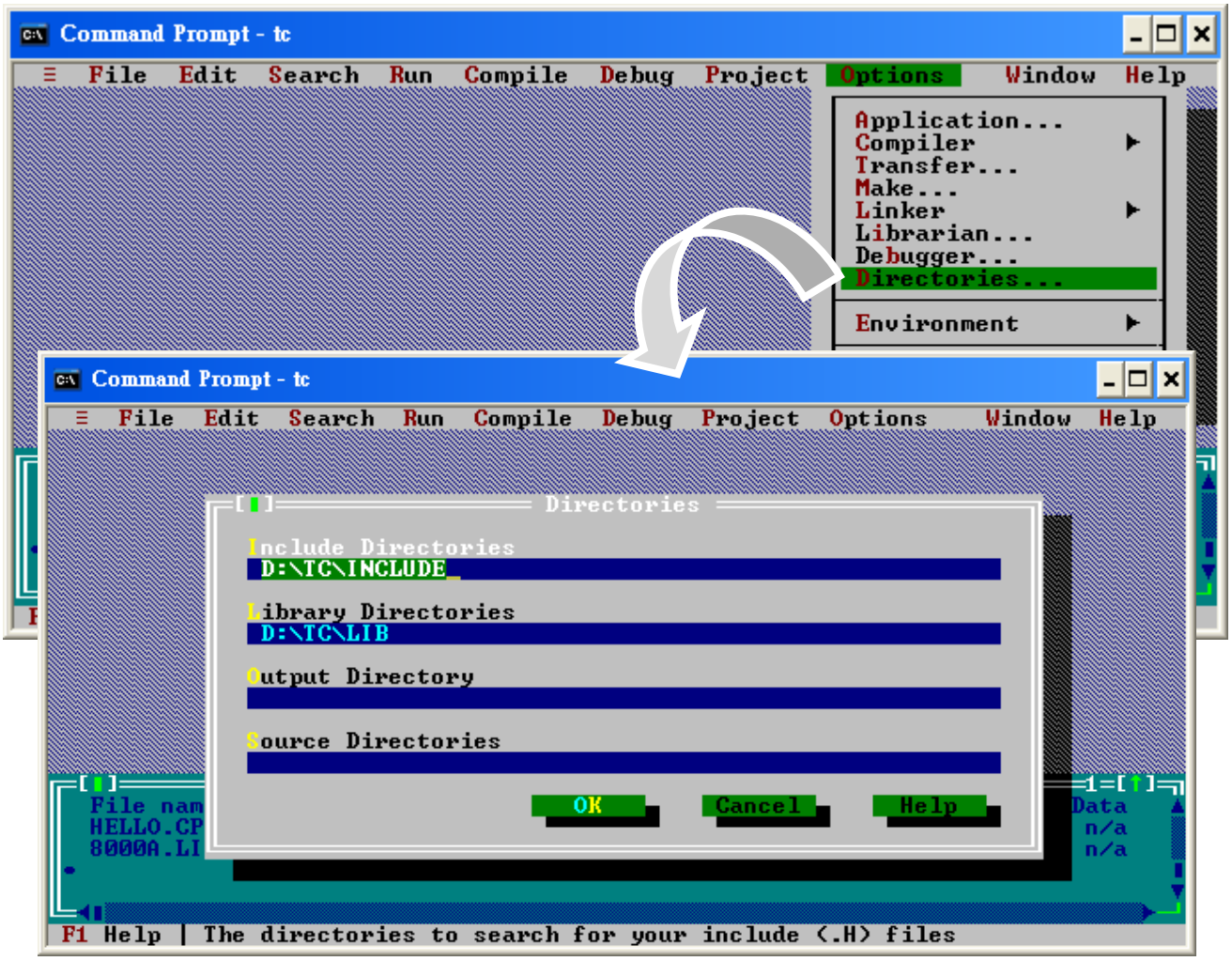
Step 11: Set the memory model to large

i. Select “Directories…” from the “Options” menu

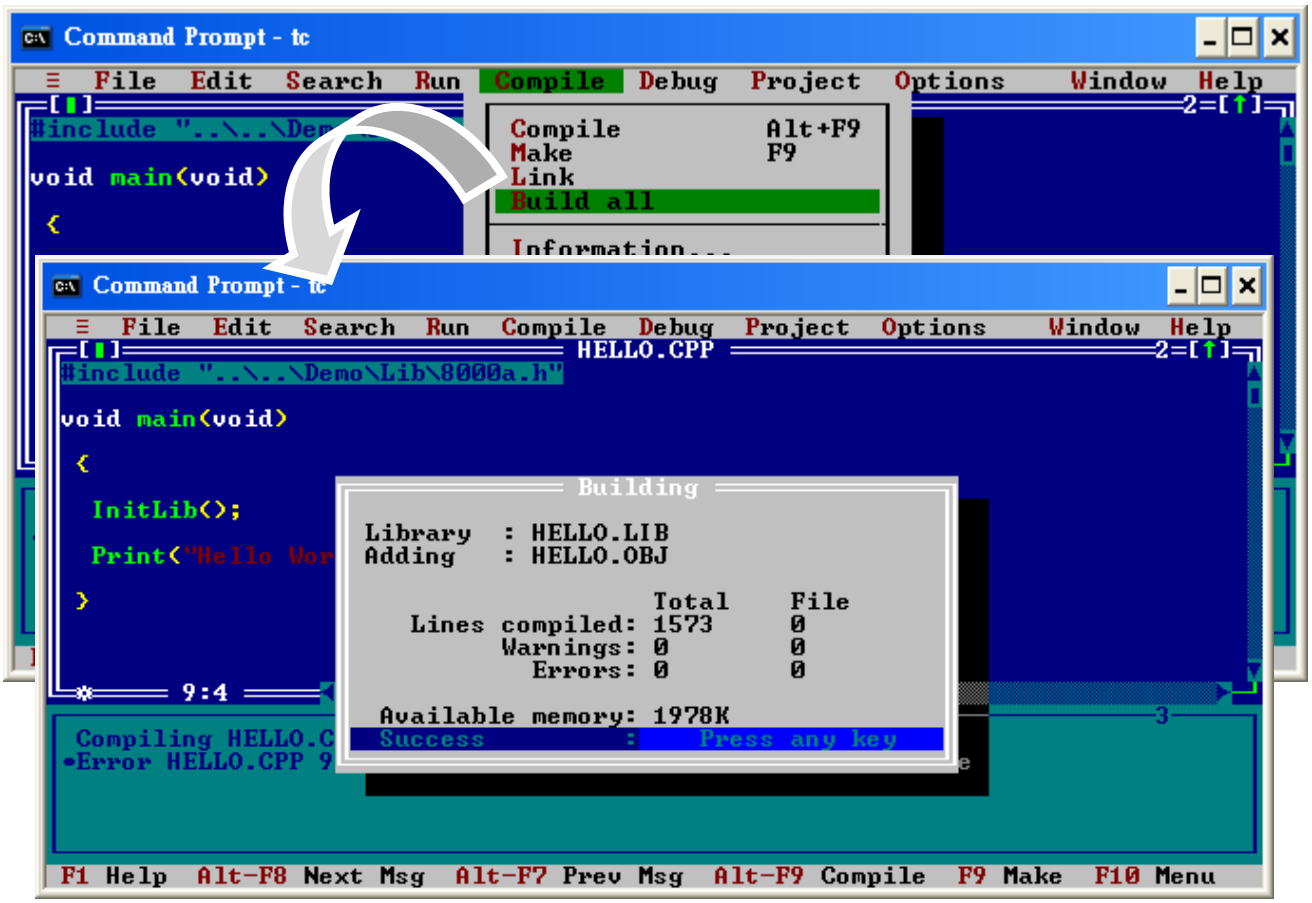
ii. On “Include Directories” option, specify the header file

iii. On “Library Directories” option, specify the function library file

iv. Select “OK”

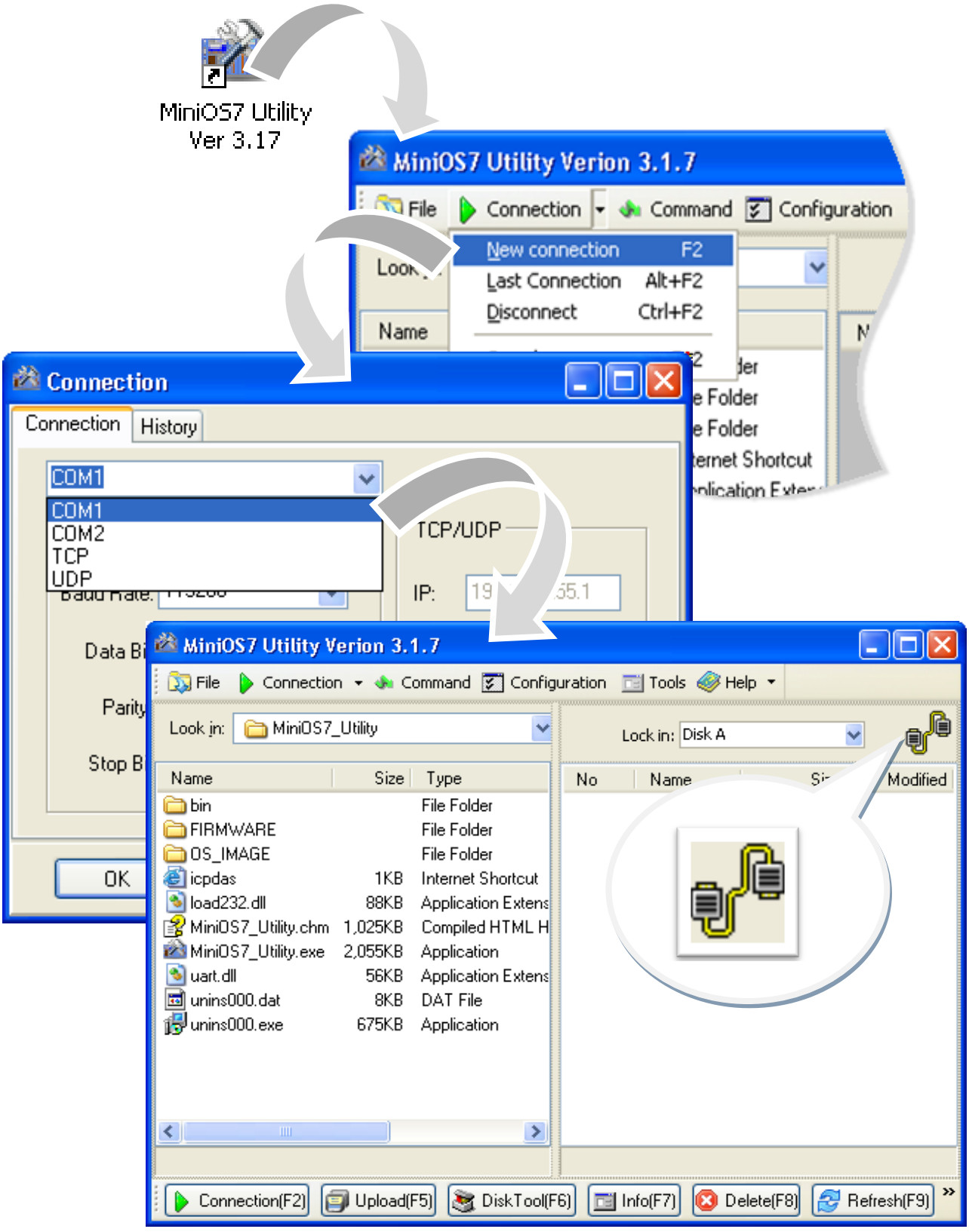


Step 12: Select “Build all” from the “Compile” menu to build the project



Step 13: Use the MiniOS7 Utility to connect the uPAC-7186EX

For more detailed information about this process, please refer to section "2.3.1. Establishing a connection".



Step 14: Upload and execute files

For more detailed information about this process, please refer to section “2.3.2. UPloading and executing programs on uPAC-7186EX

4. API and Demo Program Reference

There are several demo programs that have been designed for uPAC-7186EX. You can examine the demo source code, which includes numerous comments, to familiarize yourself with the MiniOS7 API, This will allow to quickly develop your own applications quickly by modifying these demo programs.

- **Basic**

Folder	Demo	Explanation
File	Config_1_Basic	Reads information from a text file (basic).
	Config_2_Advanced	Reads a config file (text file)(advanced).
Hello	Hello_C	Reads the library version and flash memory size.
	Hello_C++	
Misc	Reset	Resets the software.
	Runprog	Illustrates how to select an item and run it.
	Serial	Illustrates how to retrieve 64-bit hardware unique serial number.
	Watchdog	Enables the WDT or bypasses the enable WatchDog function.
Smmi	SystemKey	Shows how to operate the systemkey function simply and easily.
	Led	Shows how to control the red LED and 7-segment display.
Memory	S256	Shows how to read or write to the 256K byte battery backup.

Folder	Demo	Explanation
DateTime	DateTime	Shows how to read and write the date and time from the RTC.
Com port	C_Style_IO	(1) Shows how to write a function to input data. (2) Shows how to receive a string. (3) Shows how to use a C function: sscanf or just use Scanf()
	Receive	Receives data from COM port. Slv_COM.c is in non-blocked mode Receive.c is in blocked mode.
	Slv_COM	A slave COM Port demo for (request/reply) or (command/response) applications.
	ToCom_In_Out	Illustrates how to Read/Write byte data via COM Port.
Com port	7K87K_DI_for_Com	"COM Port" can be used to connect and control i-7k or i-87k series modules. ■ For uPAC-7186EX module and can use, COM2, COM3. ■ For uPAC-7186EX module and (CPU 40 and 80M) can use, COM3, COM4.
	7K87K_DO_for_Com	
	7K87K_AI_for_Com	
	AO_22_26_for_Com	
	AO_024_for_Com	
For more information about these demo programs, please refer to: CD:\ NAPDOS\7186e\ Demo\Basic\ http://ftp.icpdas.com/pub/cd/8000cd/napdos/7186e/Demo/Basic/		

4.1. API for COM port

- The uPAC-7186EX include two COM ports

  1. MiniOS7 COM port functions

  2. (C style) Standard COM port functions

4.1.1. Types of COM port functions

- **There are two types of functions below for using COM port.**

  1. MiniOS7 COM port functions

  2. (C style) Standard COM port functions

You have the alternative of MiniOS7 COM ports functions or (C style) Standard COM port functions. If you choose the ones, then the another can not be used.

- **Summarize the results of the comparison between MiniOS7 COM port functions and (C style) Standard COM port functions:**

Kinds of Functions	COM Port	Buffer		Functions			
		RX	TX	Check data	Send data	Read data	Show data
MiniOS7 COM port	0, 1, 2, etc.	1 KB	1 KB	IsCom()	ToCom()	ReadCom()	printCom()
(C style) Standard COM port	1 (Note)	512 Bytes	256 Bytes	Kbhit()	Puts() Putch()	Getch()	Print()

4.1.2. API for MiniOS7 COM port

API for using COM ports

---

1. InstallCom()

Before any COM Port can be used, the driver must be installed by calling InstallCom().

2. AddCom2fun()

Before using COM2, the AddCom2fun() must be called to work for uPAC-7186EX.

3. RestoreCom()

If the program calls InstallCom(), the RestoreCom()must be called to restore the COM Port driver.

API for checking if there is any data in the COM port input buffer

---

4. IsCom()

Before reading data from COM port, the IsCom() must be called to check whether there is any data currently in the COM port input buffer.

API for reading data from COM ports

---

5. ReadCom()

After IsCom() confirms that the input buffer contains data, the ReadCom() must be called to read the data from the COM port input buffer.

API for sending data to COM ports

---

6. ToCom()

Before sending data to COM ports, the ToCom() must be called to send data to COM ports.

For example, reading and receiving data through the COM1:

```
#include <stdio.h>
#include "7186e.h"

void main(void)
{
  int quit=0, data;

   InitLib();  /* Initiate the 7186e library */
  InstallCom(1, 115200, 8, 0, 1);  /* Install the COM1 driver */

  while(!quit)
  {
    if(IsCom(1))  /* Check if there is any data in the COM port input buffer */
    {
      data=ReadCom(1);  /* Read data from COM1 port */
      ToCom(1, data);  /* Send data via COM1 port */
      if(data=='q') quit=1;  /* If 'q' is received, exit the program */
    }
  }
    RestoreCom(1);  /* Uninstall the COM1 driver */
}
```

7. printCom()

Functions such as printfCom() in the C library allow data to be output from COM ports.

For example, showing data from the COM1 port:

```
#include <stdio.h>
#include “7186e.h”

void main(void)
{
  int i;

 /* Initiate the 7186e library */
  InitLib();
  InstallCom(1, 115200, 8, 0, 1);  /* Install the COM1 driver */

  for (i=0;i<10;i++)
  {
    printCom(1,”Test %d\n\r”, i);
  }
  Delay(10);  /* Wait for all data are transmitted to COM port */
  RestoreCom(1);
}
```

► For more demo program about the COM port, please refer to:

CD:\ NAPDOS\7186e\ Demo\Basic\com_port

http://ftp.icpdas.com/pub/cd/8000cd/napdos/7186e/Demo/Basic/com_port

4.1.3. API for standard COM port

- **The standard COM port is used to download program from PC to the uPAC-7186EX.**

The following configurations of the standard COM port are fixed:

Baudrate=115200 bps, Data format=8 bits

Parity check=none, Start bit=1, Stop bit=1

API for checking if there is any data in the input buffer

---

1. Kbhit()

Before reading data from standard I/O port, the kbhit() must be called to check whether there is any data currently in the input buffer.

API for reading data from standard I/O port

---

2. Getch()

After kbhit() confirms that the input buffer contains data, the Getch() must be called to read data from the input buffer.

API for sending data to standard I/O port

---

3. Puts() – For sending a string

Before sending data to standard I/O port, the Puts() must be called to send data to COM Port.

4. Putch( ) – For sending one character

Before sending data to standard I/O port, the Putch() must be called to send data to COM Port.

API for showing data from standard I/O port

---

5. Print()

Functions such as Print() in the C library allow data to be output from the COM Port.

For example, reading and receiving data through COM1:

```
#include<stdio.h>
#include "7186e.h"

void main(void)
{
 int quit=0, data;

 InitLib();   /* Initiate the 7186e library */

 while(!quit)
 {
  if(Kbhit())  /* Check if any data is in the input buffer */
  {
   data=Getch();  /* Read data from COM1 */
   Putch(data);  /* Send data to COM1 */
  if(data=='q') quit=1;  /* If 'q' is received, exit the program */
  }
 }
}
```

For example, showing data through COM1:

```
#include <stdio.h>
#include “7186e.h”

void main(void)
{
  int i;

 /* Initiate the 7186e library */
  InitLib();

  for(i=0;i<10;i++)
  {
     Print(“Test %d\n\r”,i);
  }
}
```

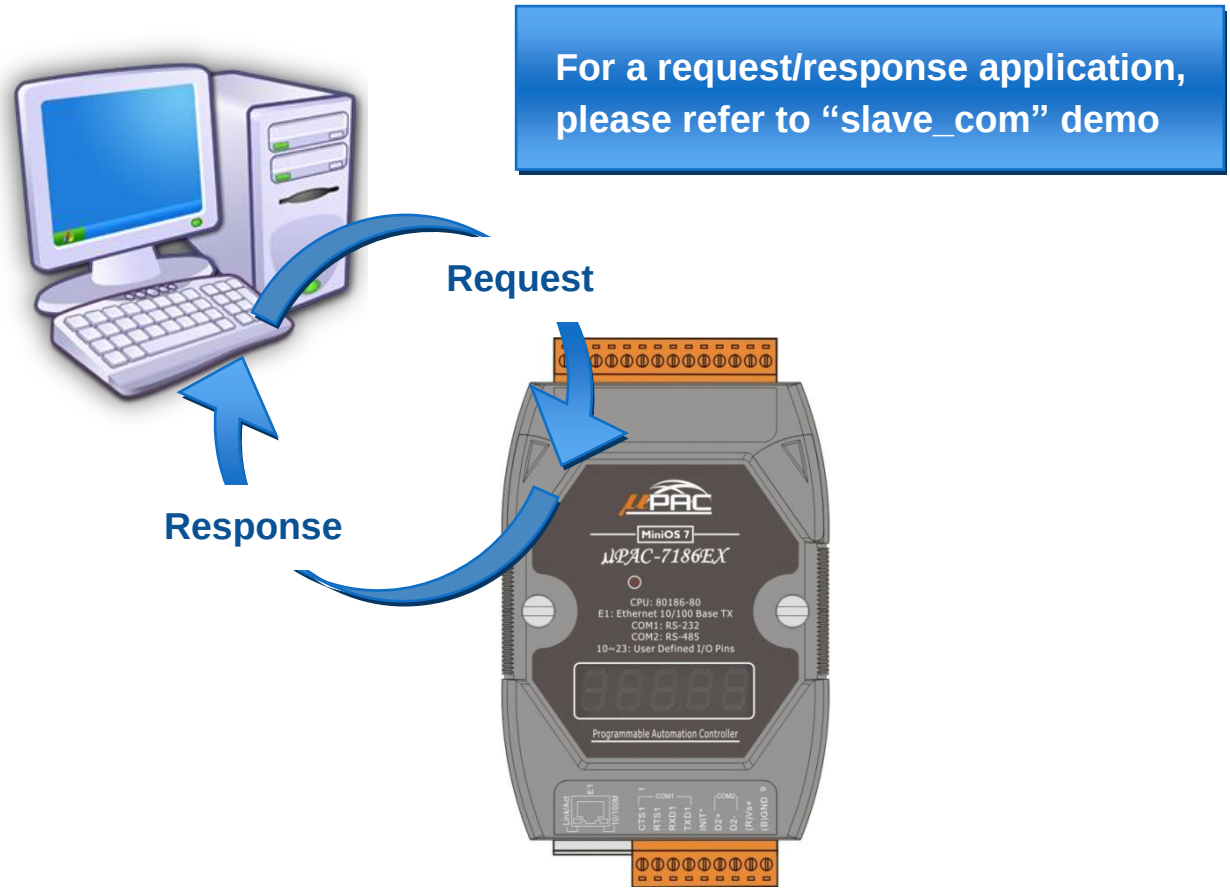
4.1.4. Comparing with MiniOS7 COM port function and Standard COM port function

For example, learning to show the ASCII code:

MiniOS7 COM port functions	Standard COM port functions
#include<stdio.h> #include "7186e.h" void main(void) { unsigned char item; InitLib(); InstallCom(1, 115200, 8, 0, 1); printCom(1,"Hits any key.\n"); printCom(1,"Hit the ESC to exit!\n"); for(;;) { if(IsCom(1)) { item=ReadCom(1); if(item=='q') { return; } else { printCom(1,"----------\n\r"); printCom(1,"char:"); ToCom(1,item); printCom(1,"\n\rASCII(%c)\n\r",item) ; printCom(1,"Hex(%02X)\n\r",item); } } } Delay(10); RestoreCom(1); }	**#include<stdio.h> #include "7186e.h" void main(void) { unsigned char item; InitLib(); Print("Hits any key.\n"); Print("Hits the ESC to exit !\n"); for(;;) { if(kbhit()) { item=Getch(); if(item=='q') { return; } else { Print("----------\n\r"); Print("char:"); Putch(item); Print("\n\rASCII(%c)\n\r",item); Print("Hex(%02X)\n\r",item); } } } }**

4.1.5. Request/Response protocol define on COM port

Request/Response communication is very typical protocol architecture, if you want to design a command set of communication protocol as table below, you can refer to “slave_com” demo.



Request	Response
GetCounter	>1234
SetDO1	>OK
ResetDO2	>OK
GetVersion	>V1.0.0

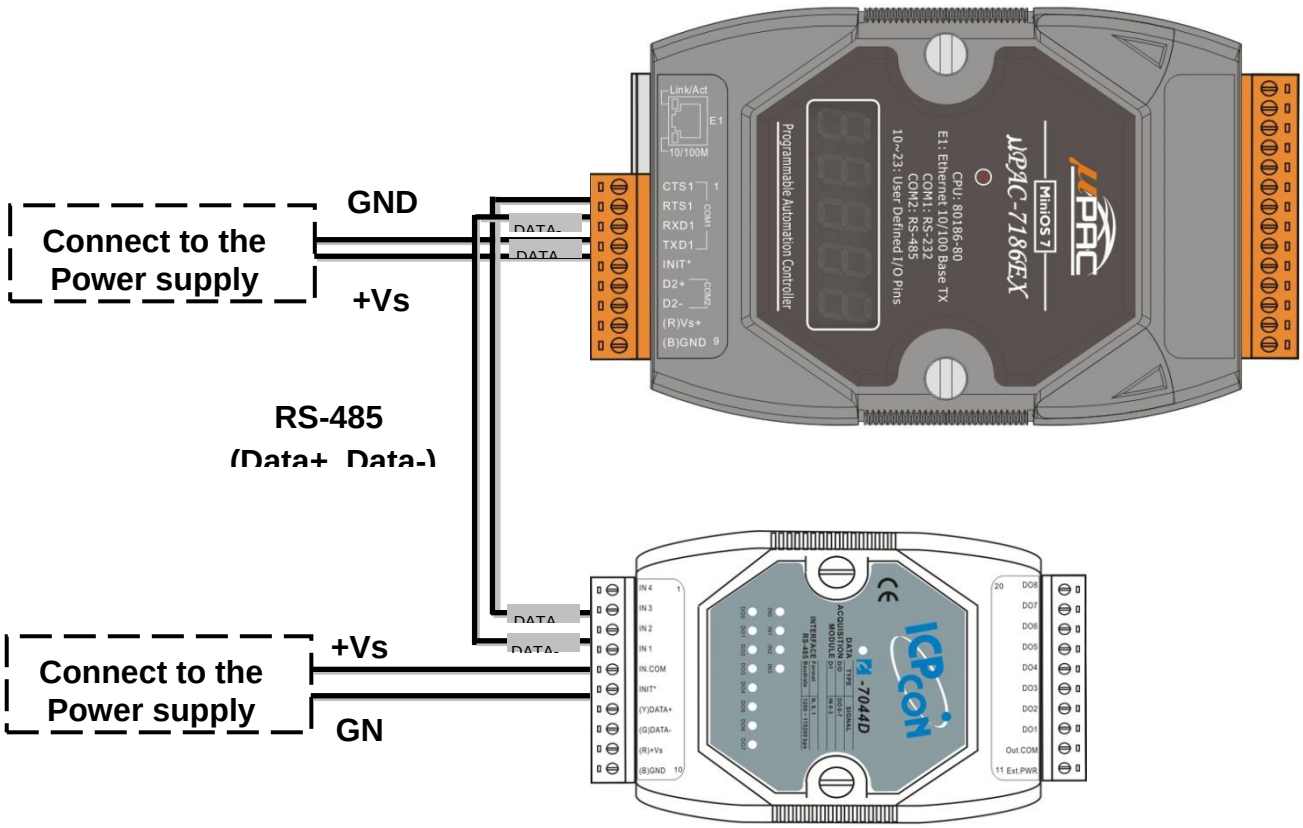
For more demo program about the COM port, please refer to:

CD:\ NAPDOS\7186e\ Demo\Basic\com_port

http://ftp.icpdas.com/pub/cd/8000cd/napdos/7186e/Demo/Basic/com_port

4.2. API for I/O modules

- The uPAC-7186EX is equipped with a RS-485 communication interface, COM2, to access the i-7K series I/O modules for a wide range of RS-485 network application, as shown below.



µPAC-7186EX/i-7000 modules

Steps to communicate with i-7K series I/O modules:

Step 1: Use **Installcom()** to install the COM port driver.

Step 2: Use **AddCom2fun()** when using COM2

Step 3: Use **SendCmdTo7000(0,…)** to send commands

Step 4: Use **ReceiveResponseFrom7000_ms()** to get the response.

Step 5: Use **RestoreCom()** to restore the COM port driver

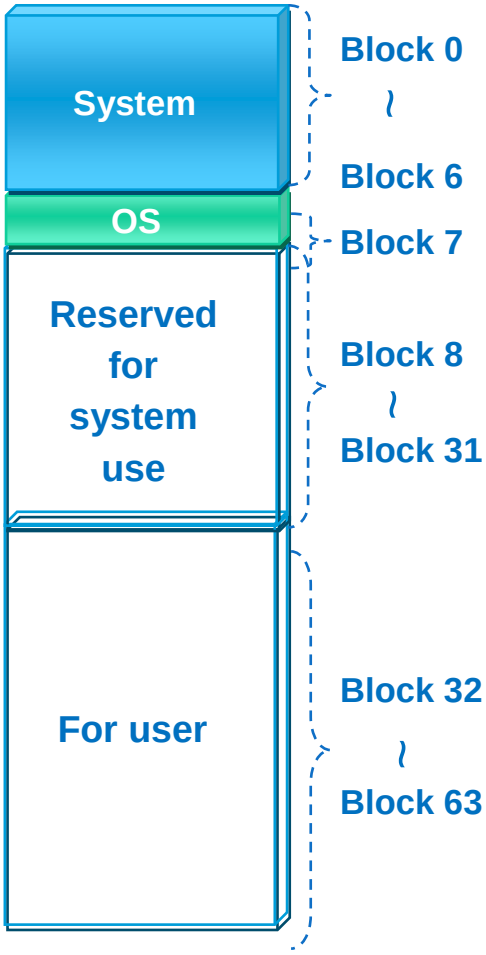
The **AddCom2fun()** function must be called when using the COM2 after using the **InstallCom(2,…)** function.

For example, to send a command '$00M' to slot 7's i-7K I/O module for getting the module name:

```
#include <stdio.h>
#include "7186e.h"

 void main(void)
 {
    unsigned char InBuf0[60];
    InitLib();   /* Initiate the 7186e library */

    InstallCom(1,115200,8,0,1);   /* Install the COM1 driver */
    InstallCom(2,115200,8,0,1);   /* Install the COM2 driver */

    AddCom2fun();

    SendCmdTo7000(2,"$00M",0);   /* Send a command to COM2 */

    /* Timeout = 50ms, check sum disabled */
    ReceiveResponseFrom7000_ms(2,InBuf0,50,0);

    printCom(1,"Module Name = %s", InBuf0);
    Delay(10);   /* Wait for all data are transmitted to COM port */
    RestoreCom(1);   /* Uninstall the COM1 driver */

    RestoreCom(2);   /* Uninstall the COM2 driver */
  }
```

4.3. API for EEPROM

- The EEPROM contains 64 blocks (block 0 ~ 63), and each block has 256 bytes (address 0 ~ 255), with a total size of 16,384 bytes (16K) capacity.
- The default mode for EEPROM is write-protected mode.
- The system program and OS are stored in EEPROM that are allocated as shown below.



API for writing data to the EEPROM

1. EE_WriteEnable()

Before writing data to the EEPROM, the EE_WriteEnable() must be called to write-enable the EEPROM.

2. EE_WriteProtect()

After the data has finished being written to the EEPROM, the EE_WriteProtect() must be called to in order to write-protect the EEPROM.

3. EE_MultiWrite()

After using the EE_WriteEnable() to write-enable EEPROM, the EE_MultiWrite() must be called to write the data.

API for reading data from the EEPROM

4. EE_MultiRead()

The EE_WriteEnable() must be called to read data from the EEPROM no matter what the current mode is.

For example, to write data to block1, address 10 of the EEPROM:

```
#include <stdio.h>
#include "7186e.h"

 void main(void)
 {
    int data=0x55, data2;

    InitLib();   /* Initiate the 7186e library */
    EE_WriteEnable();
    EE_MultiWrite(1,10,1,&data);
    EE_WriteProtect();

    EE_MultiRead(1,10,1,&data2);   /* Now data2=data=0x55 */
  }
```

To write an integer to the EEPROM, the EE_WriteEnable() function must be called twice, in the same manner as writing data to the NVRAM

► For more demo program about the EEPROM, please refer to:

CD:\ NAPDOS\7186e\ Demo\Basic\memory

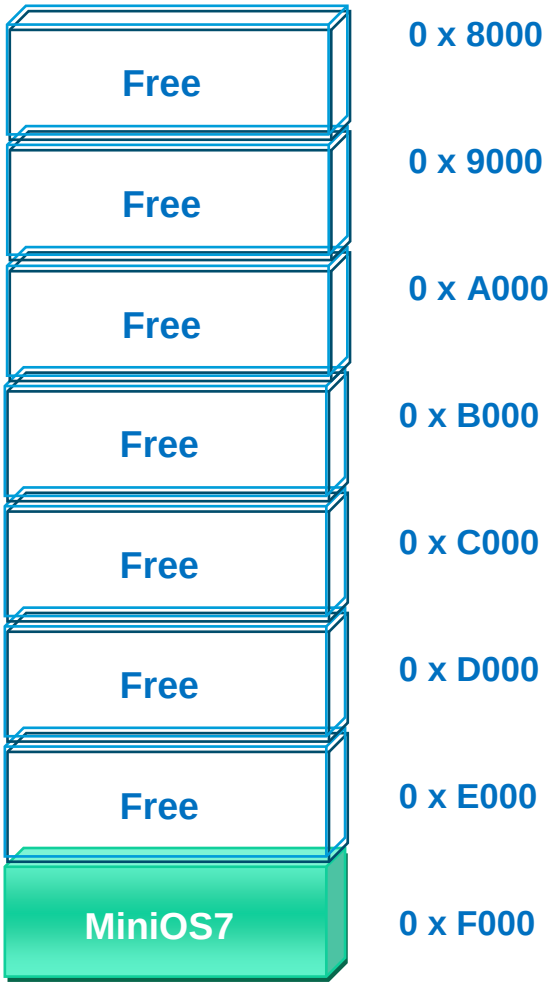
http://ftp.icpdas.com/pub/cd/8000cd/napdos/7186e/demo/basic/memory

4.4. API for Flash Memory

Free: 448 K bytes

MiniOS7: 64 K bytes

Total Size: 512 K bytes



- The uPAC-7186EX module contains 512K bytes of Flash memory.
- MiniOS7 uses the last 64K bytes, the other parts of the memory are used to store user programs or data.
- Each bit of the Flash memory only can be written from 1 to 0 and cannot be written from 0 to 1.
- Before any data can be written to the Flash memory, the flash must be erased first, which returns all data to 0xFF, meaning that all data bits are set to “1”. Once their is completed, new data can be written.

API for writing data to the Flash Memory

1. FlashWrite()

The FlashWrite() must be called to write data to the Flash Memory.

API for reading data from the Flash Memory

2. FlashRead()

The FlashRead() must be called to read data from the Flash Memory.

For example, to write an integer to segment 0xD000, offset 0x1234 of the Flash memory:

```
#include <stdio.h>
#include “7186e.h”

 void main(void)
 {
    int data=0xAA55, data2;
    char *dataptr;
    int *dataptr2;

 InitLib();   /* Initiate the 7186e library */
    dataptr=(char *)&data;
    FlashWrite(0xd000,0x1234, *dataptr++);
    FlashWrite(0xd000,0x1235, *dataptr);

    /* Read data from the Flash Memory (method 1) */
    dataprt=(char *)&data2;
    *dataptr=FlashRead(0xd000,0x1234);
    *(dataptr+1)=FlashRead(0xd000,0x1235);

    /* Read data from the Flash Memory (method 2) */
    dataptr2=(int far *)_MK_FP(0xd000,0x1234);
    data=*data;
  }
```

► For more demo program about the Flash memory, please refer to:

CD:\ NAPDOS\7186e\ Demo\Basic\memory

http://ftp.icpdas.com/pub/cd/8000cd/napdos/7186e/Demo/Basic/memory

4.5. API for NVRAM and RTC

- The uPAC-7186EX is equipped with an RTC (Real Time Clock), and 31 bytes of NVRAM memory can be used to store data.
- NVRAM is the same as SRAM, but it uses a battery to retain the data, so the data. store in the NVRAM is not lost when the module is powered off and can be used for 10 years.
- NVRAM has no limit on the number of times the data can be written. (Both Flash and EEPROM both have a limit on the numbers of data can be re-written.)

API for writing data to the NVRAM

---

1. WriteNVRAM()

The WriteNVRAM() must be called in order to write data to the NVRAM.

API for reading data from the NVRAM

---

2. ReadNVRAM()

The ReadNVRAM() must be called in order to write data to the NVRAM.

For example, use the following code to write data to the NVRAM address 0:

```
#include <stdio.h>
#include “7186e.h”

 void main(void)
 {
    int data=0x55, data2;

    InitLib();   /* Initiate the 7186e library */
    WriteNVRAM(0,data);
    data2=ReadNVRAM(0);   /* Now data2=data=0x55 */
  }
```

For example, the following can be used to write an integer (two bytes) to NVRAM:

```
#include <stdio.h>
#include “7186e.h”

 void main(void)
 {
    int data=0xAA55, data2;
    char *dataptr=(char *)&data;

    InitLib();   /* Initiate the 7186e library */
    WriteNVRAM(0, *dataptr);   /* Write the low byte */
    WriteNVRAM(1, *dataptr+1);   /* Write the high byte */
    dataptr=(char *) &data2;
    *dataptr=ReadNVRAM(0);   /* Read the low byte */
    (*dataptr+1)=ReadNVRAM(1);   /* Read the high byte */
  }
```

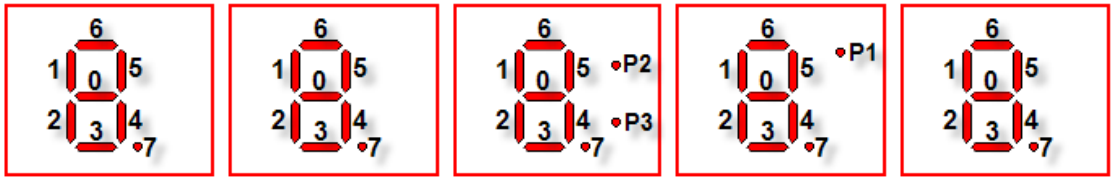
► For more demo program about the NVRAM and RTC, please refer to:

CD:\ NAPDOS\7186e\Demo\Basic\memory

http://ftp.icpdas.com/pub/cd/8000cd/napdos/7186e/Demo/Basic/memory

4.6. API for 5-Digit LED

- The uPAC-7186EX contains a 5-Digit 7-SEG LED with a decimal point on the left-hand side of each digit, which be used to display numbers, IP addresses, time, and so on.



API for controlling the 5-Digit 7-SEG LED

---

1. Init5DigitLed()

Before using any LED functions, the Init5DigitLed() must be called to initialize the 5-Digit 7-SEG LED.

API for displaying a message on the 5-Digit 7-SEG LED

---

2. Show5DigitLed()

After the Init5DigitLed() is used to initialize the 5-Digit 7-SEG LED, the Show5DigitLed() must be called to display information on the 5-Digits 7-SEG LED.

For example, use the following code to display “8000E” on the 5-Digit 7-SEG LED:

```
#include <stdio.h>
#include “7186e.h”

 void main(void)
 {
 InitLib();   /* Initiate the 7186e library */

    Init5DigitLed();

    Show5DigitLed(1,8);
    Show5DigitLed(2,0);
    Show5DigitLed(3,0);
    Show5DigitLed(4,0);
    Show5DigitLed(5,14);   /* The ASCII code for the letter ‘E’ is 14 */

  }
```

► For more demo program about the 5-digit 7-SEG LEDs, please refer to:

CD:\ NAPDOS\7186e\ Demo\Basic\smmi
http://ftp.icpdas.com/pub/cd/8000cd/napdos/7186e/Demo/Basic/smmi

4.7. API for Timer and WatchDogTimer

- The uPAC-7186EX can support a single main time tick, 8 stop watch timers and 8 count down timers.
- The uPAC-7186EX uses a single 16-bit timer to perform these timer functions, with a timer accuracy of 1 ms..

API that can be used to control the Timer

---

1. TimerOpen()

Before using the Timer functions, the TimerOpen() must be called at the beginning of the program.

API for reading the Timer

---

2. TimerResetValue()

Before reading the Timer, the TimerResetValue() must be called to reset the main time ticks to 0.

3. TimerReadValue()

After the TimerResetValue() has reset the main time ticks to 0, the TimerReadValue() must be called to read the main time tick.

API for stopping the Timer

---

4. TimerClose()

Before ending the program, the TimerClose() must be called to stop the Timer.

For example, the following code can be used to read the main time ticks from 0:

```
#include <stdio.h>
#include “7186e.h”

 void main(void)
 {
 Unsigned long time iTime;

    InitLib();   /* Initiate the 7186e library */
    TimerOpen();
    While(!quit)
    {
        If(Kbhit())
            TimerResetValue();   /* Reset the main time ticks to 0 */

        iTime=TimerReadValue();   /* Read the main time ticks from 0 */
    }
    TimerClose();   /* Stop using the 8000e timer function */
 }
```

► For more demo program about the timer, please refer to:

CD:\ NAPDOS\7186e\ Demo\Basic\timer
http://ftp.icpdas.com/pub/cd/8000cd/napdos/7186e/Demo/Basic/timer

4.8. API for WatchDog Timer (WDT)

- The default WatchDog timer (WDT) value for the uPAC-7186EX module is fixed at 0.8 seconds for MiniOS7 version 2.0.
- When the uPAC-7186EX is first powered on, the WatchDog Timer will always be enabled.
- The MiniOS7 for the uPAC-7186EX will automatically refresh the WatchDog Timer after being powered on. The software driver can be called by a user program to prevent the MinOS7 from refreshing the WatchDog Timer.

API for refreshing WDT

---

1. EnableWDT()

The WDT is always enabled, before user's programming to refresh it, the EnableWDT() must be called to stop refreshing WDT.

2. RefreshWDT()

After EnableWDT() stop refreshing WDT, the RefreshWDT() must be called to refresh the WDT.

3. DisableWDT()

After user's programming to refresh WDT, the DisableWDT() should be called to automatically refresh the WDT.

For example, to refresh the Watchdog Timer:

```
#include <stdio.h>
#include “7186e.h”

 void main(void)
 {
 Unsigned long time iTime;

    InitLib();   /* Initiate the 7186e library */
    Enable WDT();
    While(!quit)
    {
         RefreshWDT();
         User_function();
    }
    DisableWDT();
  }
```

► For more demo program about the WatchDog Timer, please refer to:

CD:\ NAPDOS\7186e\ Demo\Basic\Misc
http://ftp.icpdas.com/pub/cd/8000cd/napdos/7186e/Demo/Basic/Misc

Appendix A. Frame Ground

Electronic circuits are constantly vulnerable to Electro-Static Discharge (ESD), which become worse in a continental climate area. Some I-7000 ,M-7000 and I-8000 series modules feature a new design for the frame ground, which provides a path for bypassing ESD, allowing enhanced static protection (ESD) capability and ensures that the module is more reliable.

Appendix B. What is MiniOS7

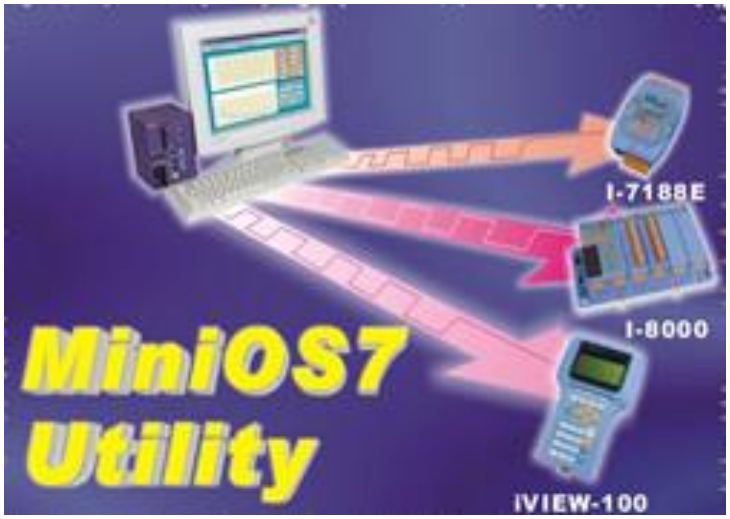
MiniOS7 is an embedded ROM-DOS operating system design by ICP DAS. It is functionally equivalent to other brands of DOS, and can run programs that are executable under a standard DOS. Photo Shop + office 2007yji4

DOS (whether PC-DOS, MS-DOS or ROMDOS) is a set of commands or code that tells the computer how to process information. DOS runs programs, manages files, controls information processing, directs input and output, and performs many other related functions.

The following table compares the features between MiniOS7 and ROM-DOS：

Feature	MiniOS7	ROM-DOS
Power-up time	0.1 sec	4 ~ 5 sec
More compact size	< 64 K bytes	64 K bytes
Support for I/O expansion bus	Yes	No
Support for ASIC key	Yes	No
Flash ROM management	Yes	No
O.S. update (Download)	Yes	No
Built-in hardware diagnostic functions	Yes	No
Direct control of 7000 series modules	Yes	No
Customer ODM functions	Yes	No
Free of charge	Yes	No

Appendix C. What is MiniOS7 Utility



MiniOS7 Utility is a tool for configuring, uploading files to all products embedded with ICPDAS MiniOS7 with easiness and quickness.

Note：Since version 3.1.1, the Utility can allow users remotely access the controllers (7188E,8000E,…ect) through the Ethernet

Functions

Supported connection ways

1. COM port connection (RS-232)
2. Ethernet connection (TCP & UDP)
   (Supported since version 3.1.1)

Maintenance

1. Upload file(s)
2. Delete file(s)
3. Update MiniOS7 image

Configuration

1. Date and Time
2. IP address
3. COM port
4. Disk size (Disk A, Disk B)

Check product information

1. CPU type
2. Flash Size
3. SRAM Size
4. COM port number

Including Frequently Used Tools

a. 7188XW
b. 7188EU
c. 7188E
d. SendTCP
e. Send232
f. VxComm Utility

PC System Requirements

1. IBM compatible PC
2. Windows 95 /98/NT/2000/XP

Supported Products

1. 7188XA
2. 7188XB
3. 7188XC
4. 7188EX series
5. All i-8000 series
6. iView100
7. uPAC-7186XB
8. uPAC-7186EX
9. ET-6000 series
10. ET-7000 series

Download location：

http://ftp.icpdas.com.tw/pub/cd/8000cd/napdos/minios7/utility/minios7_utility/

Appendix D. What is VxComm Utility

Appendix E. More C Compiler Settings

This section describes the setting of the following compilers:

- Turbo C 2.01 Compiler
- BC++ 3.1 IDE
- MSC 6.00 Compiler
- MSVC 1.50 Compiler

E.1. Turbo C 2.01

You have a couple of choices here, you can：

1：Using a command line

For more information, please refer to

CD:\8000\NAPDOS\8000\841x881x\Demo\hello\Hello_C\gotc.bat

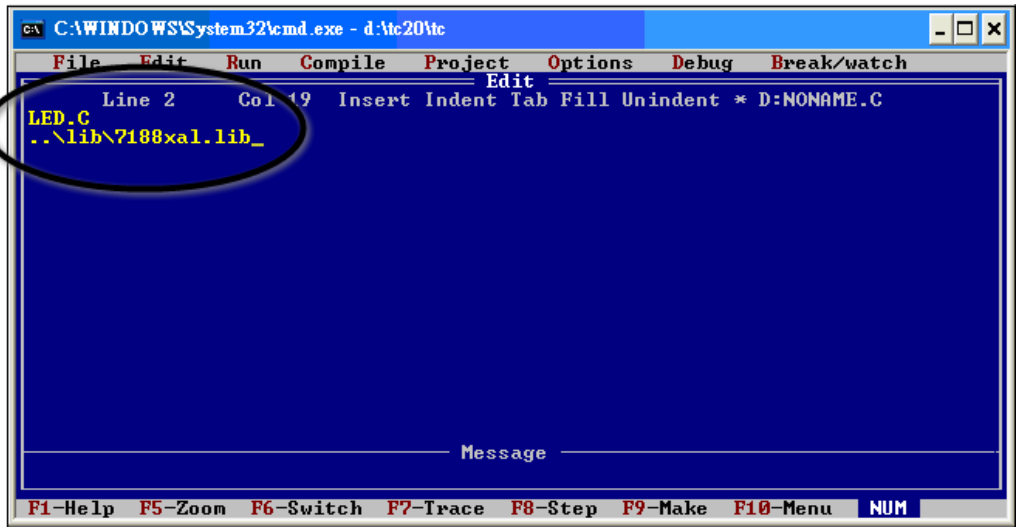
tcc -Ic:\tc\include -Lc:\tc\lib hello1.c ..\..\lib\8000e.lib

2：Using the TC Integrated Environment

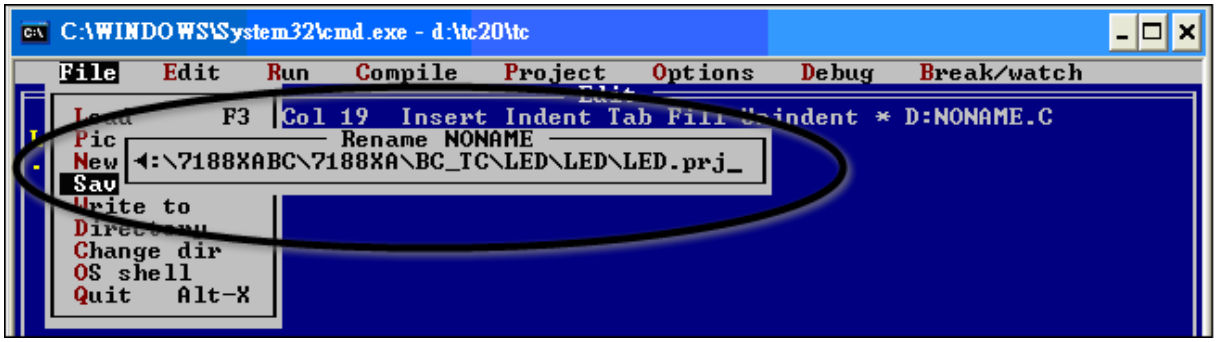
Step 1: Executing the TC 2.01

Step 2: Editing the Project file

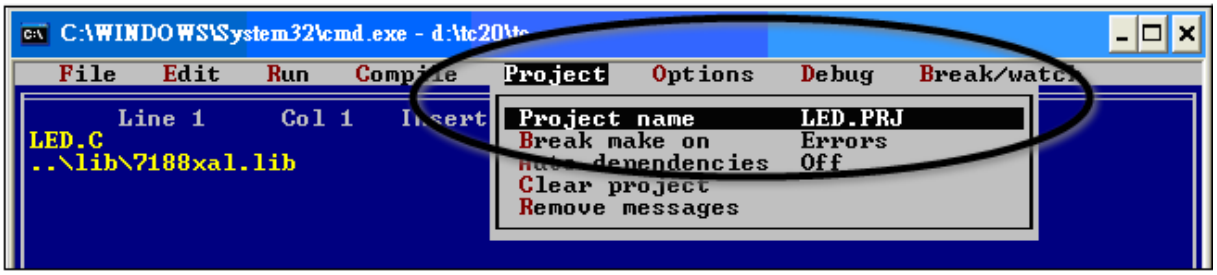
Adding the necessary library and file to the project



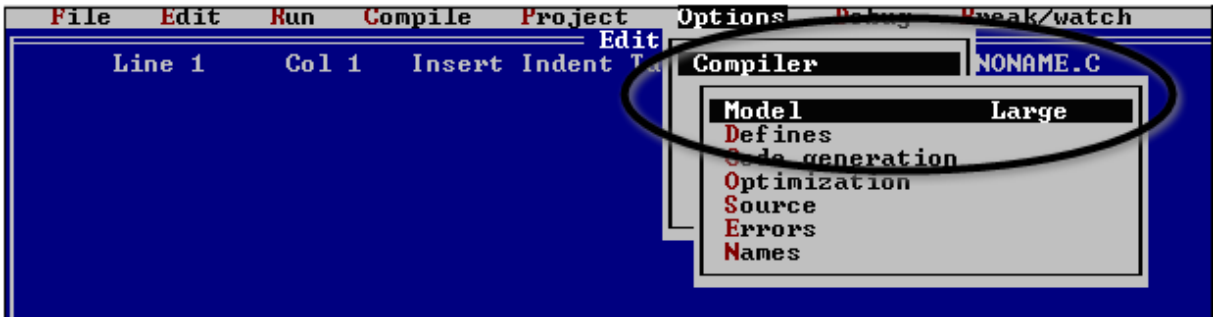
Step 3: Save the project and entering a name, such as LED.prj

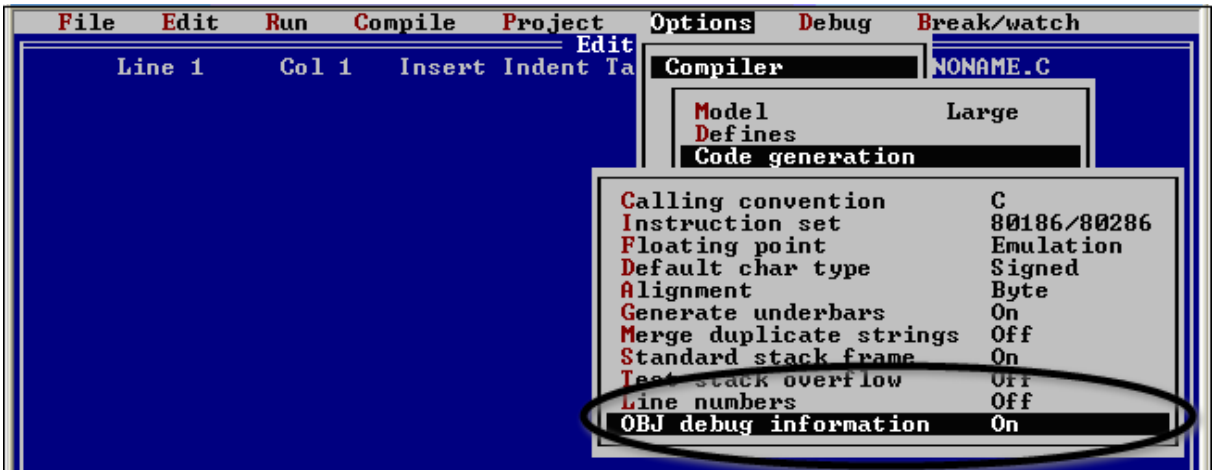


Step 4: Load the Project

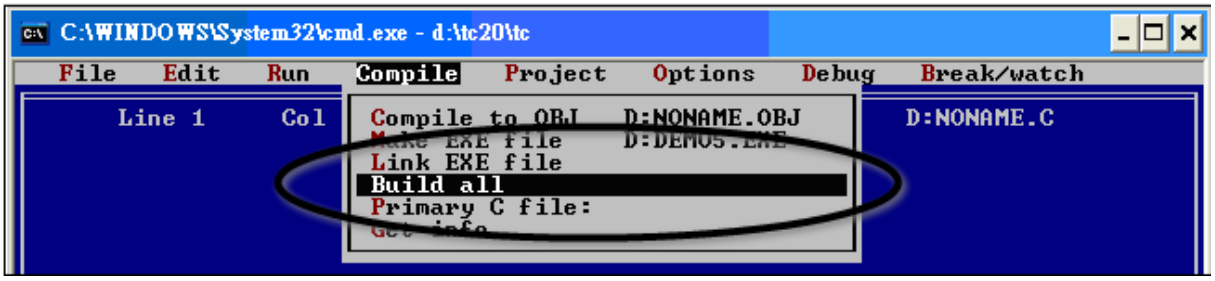


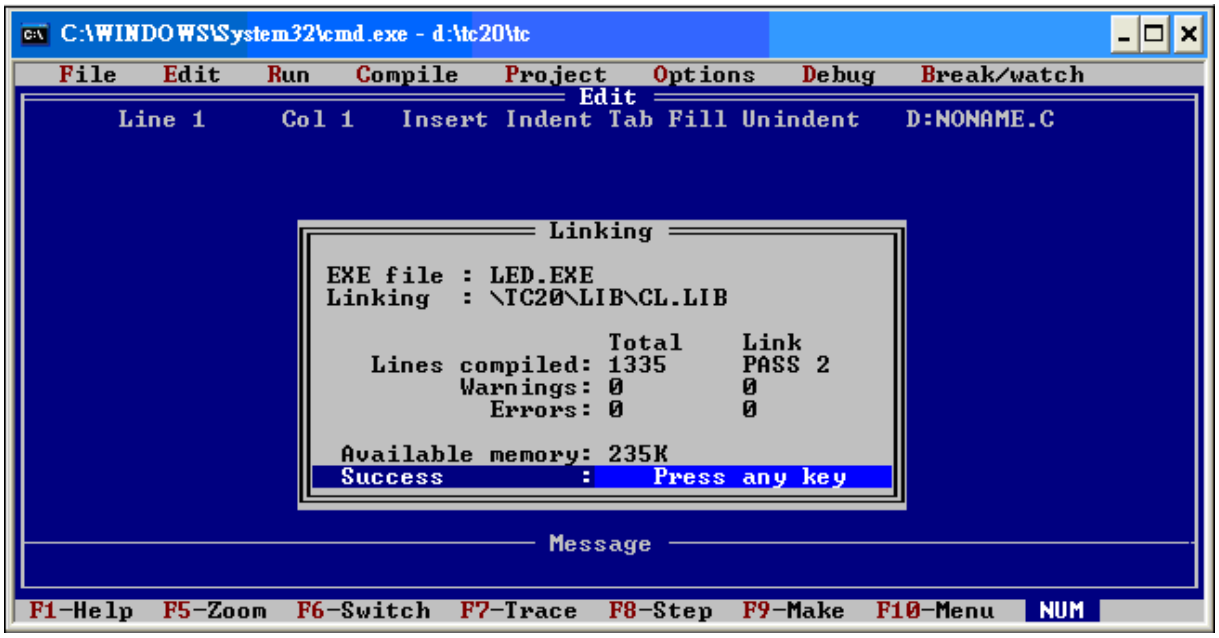
Step 5: Change the Memory model (Large for 8000e.lib) and set the Code Generation to 80186/80286





Step 6: Building the project

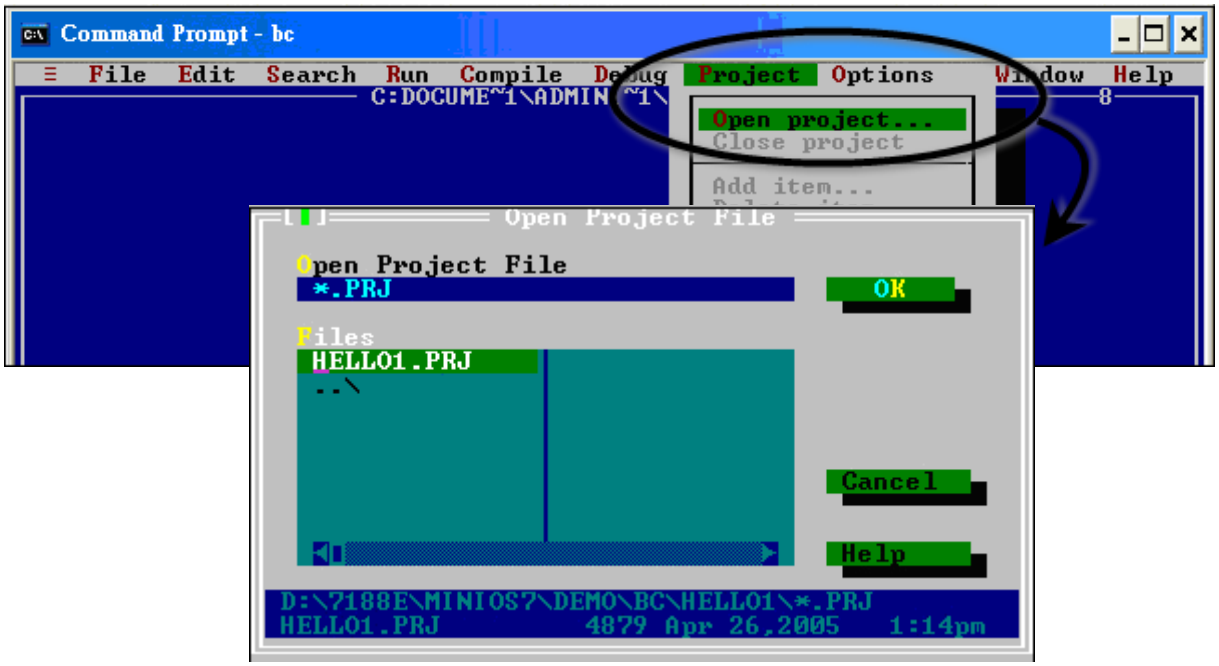




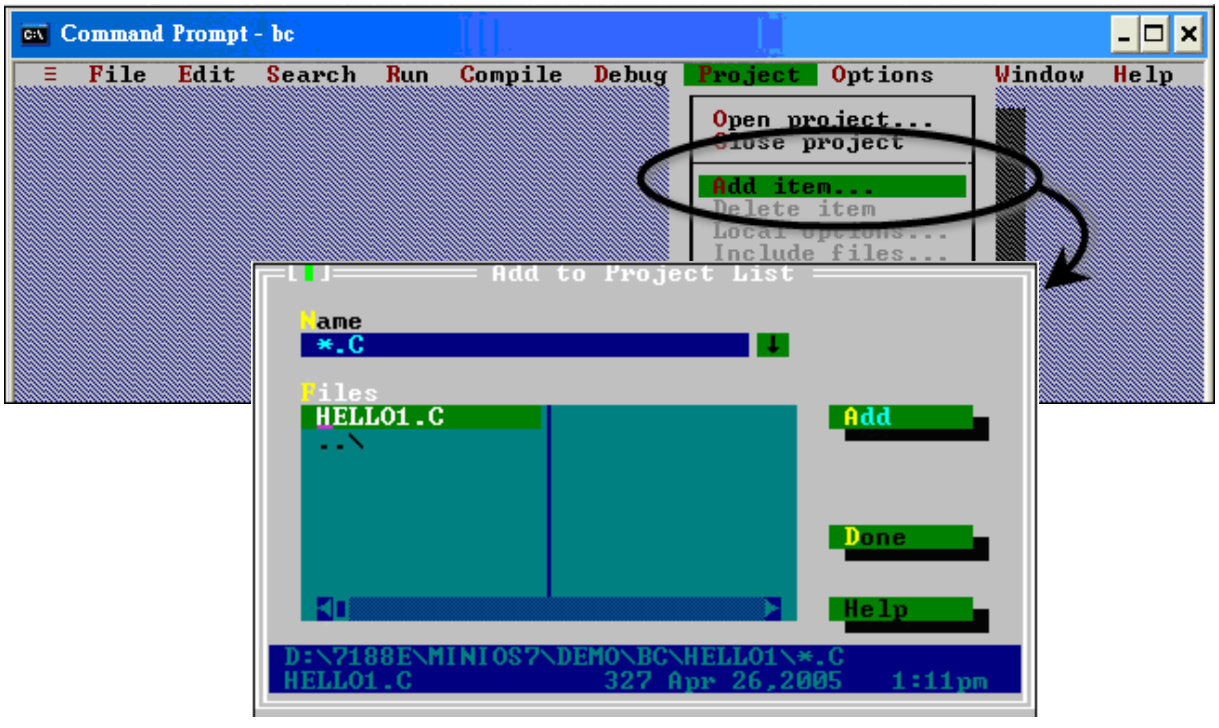
E.2. BC++ 3.1. IDE

Step 1: Executing the Borland C++ 3.1

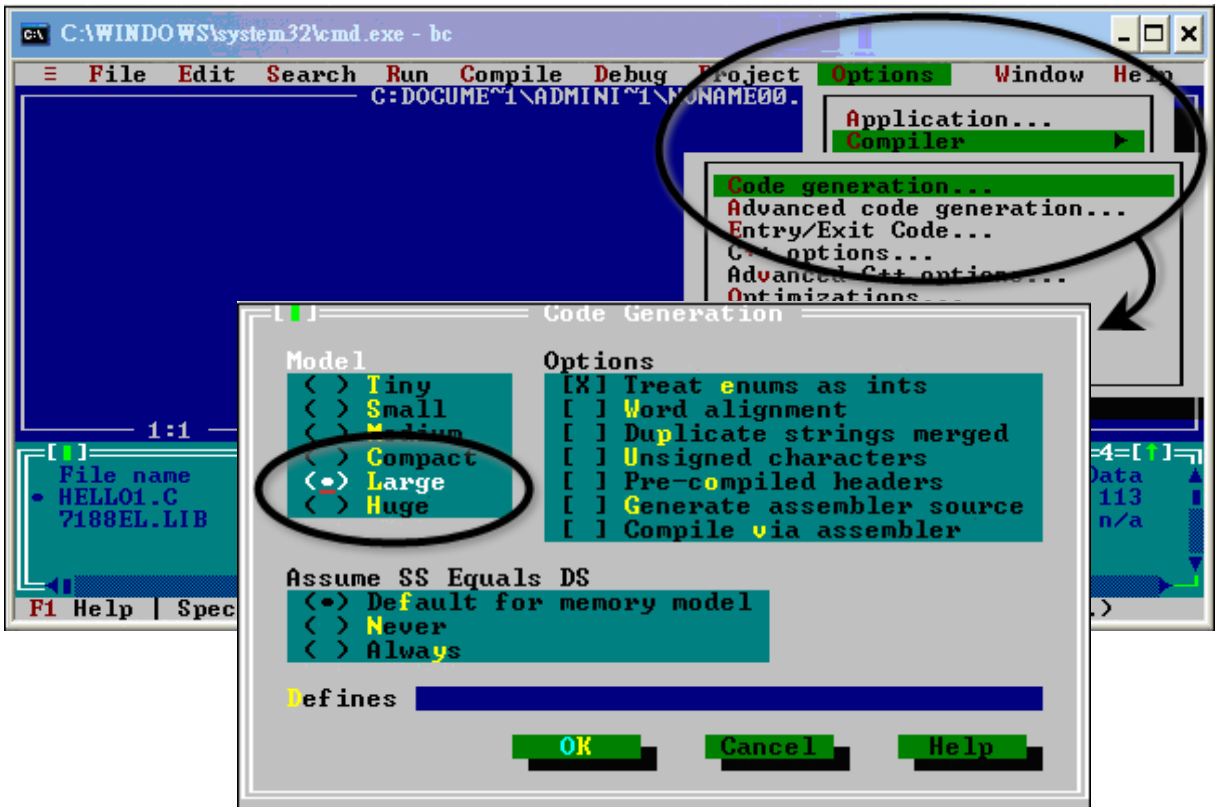
Step 2: Creating a new project file (*.prj)



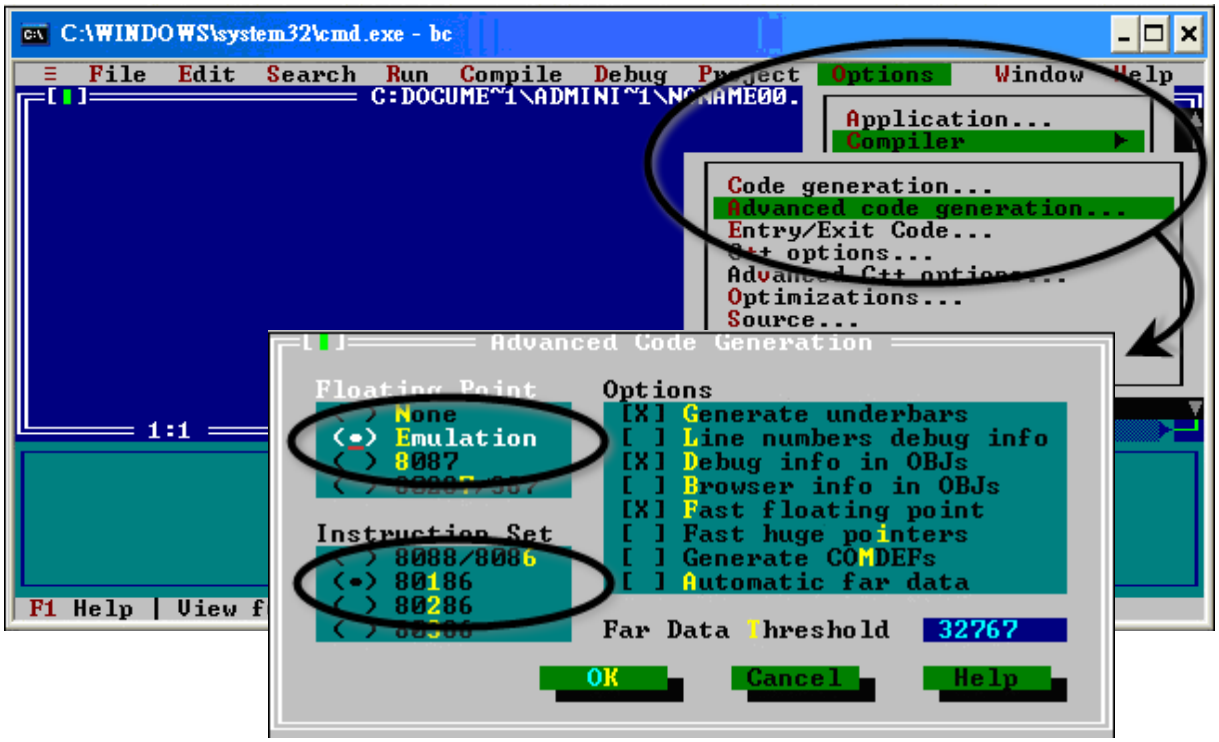
Step 3: Add all the necessary files to the project



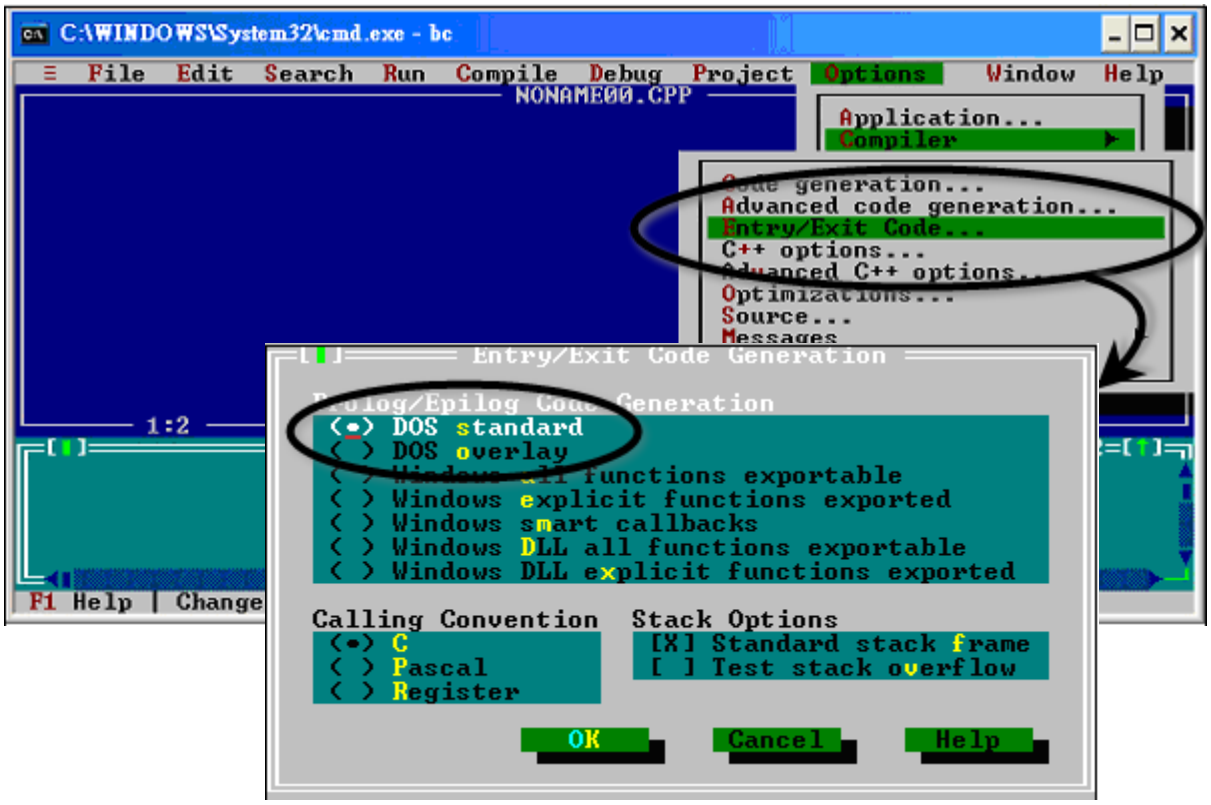
Step 4: Change the Memory model (Large for 8000e.lib)



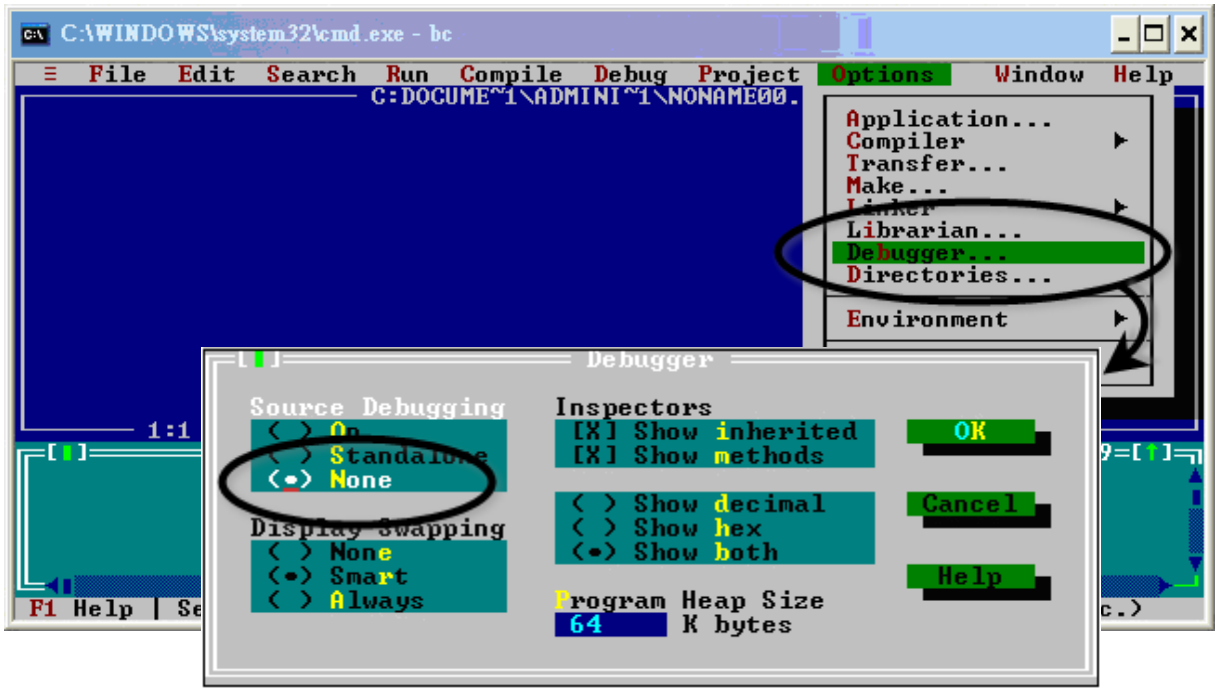
Step 5: Set the Advanced code generation options and Set the Floating Point to Emulation and the Instruction Set to 80186



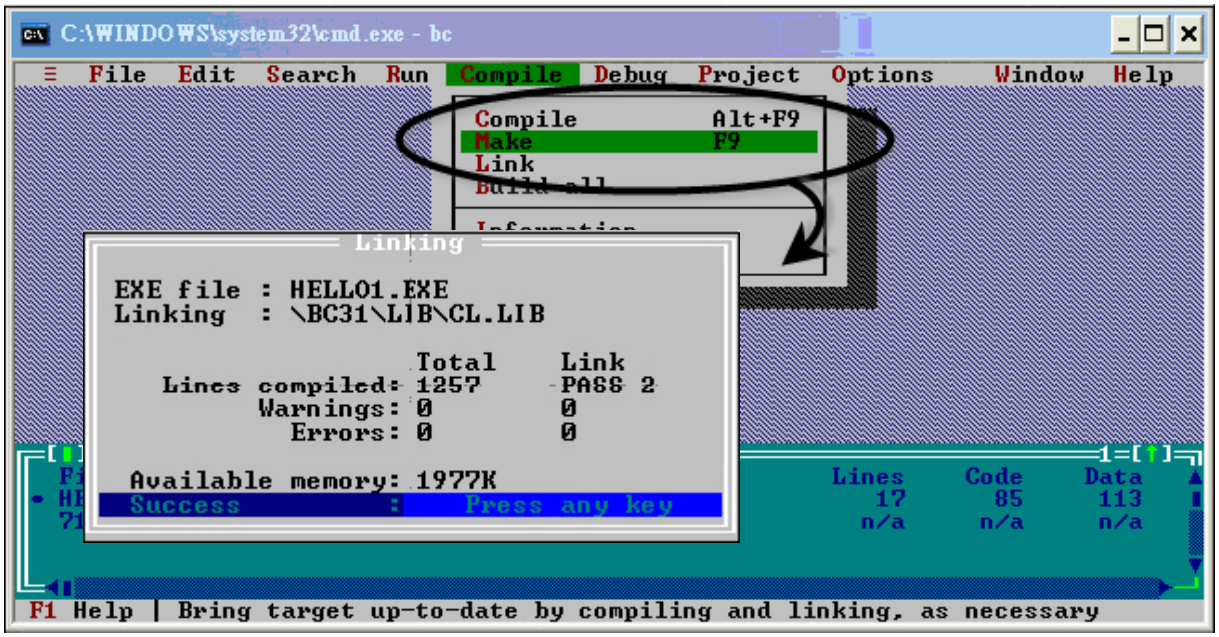
Step 6: Set the Entry/Exit Code Generation option and setting the DOS standard



Step 7: Choosing the Debugger…and set the Source Debugging to None

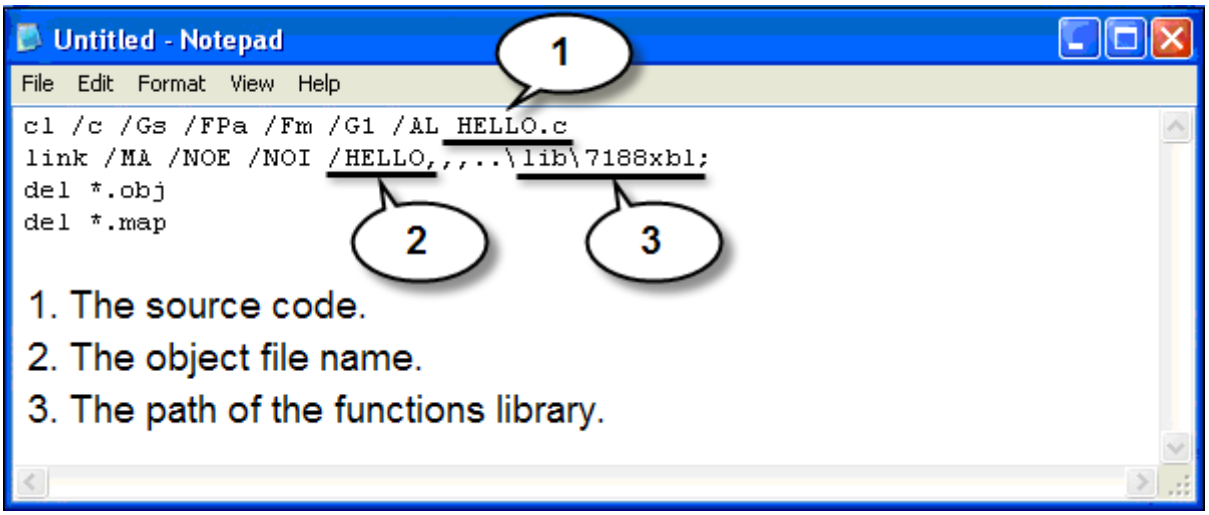


Step 8: Make the project



E.3. MSC 6.00

Step 1: In the source file folder, create a batch file called Gomsc.bat using the text editor

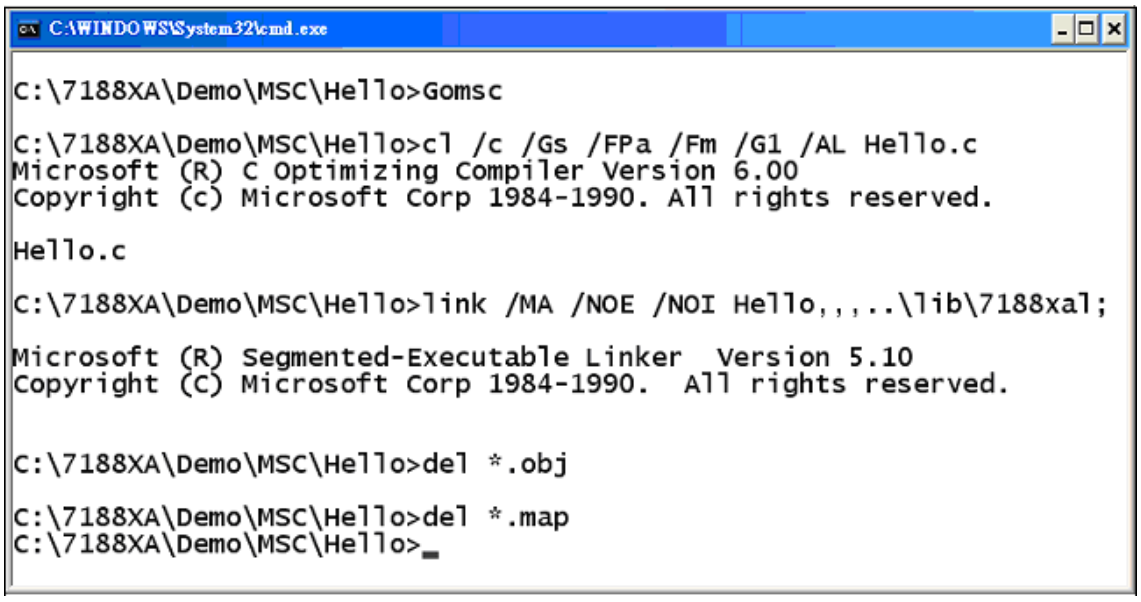


Note: : /C Don't strip comments /GS No stack checking

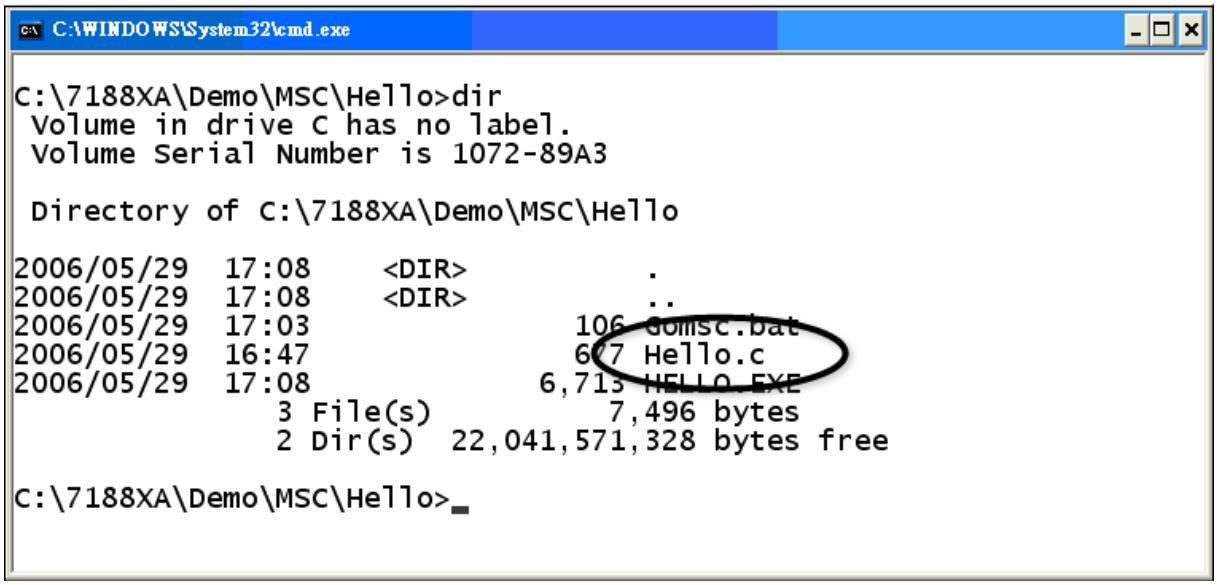
/Fpa : Calls with altmath /Fm [map file]

/G1 : 186 instructions /AL Large model

Step 2: Run the Gomsc.bat file

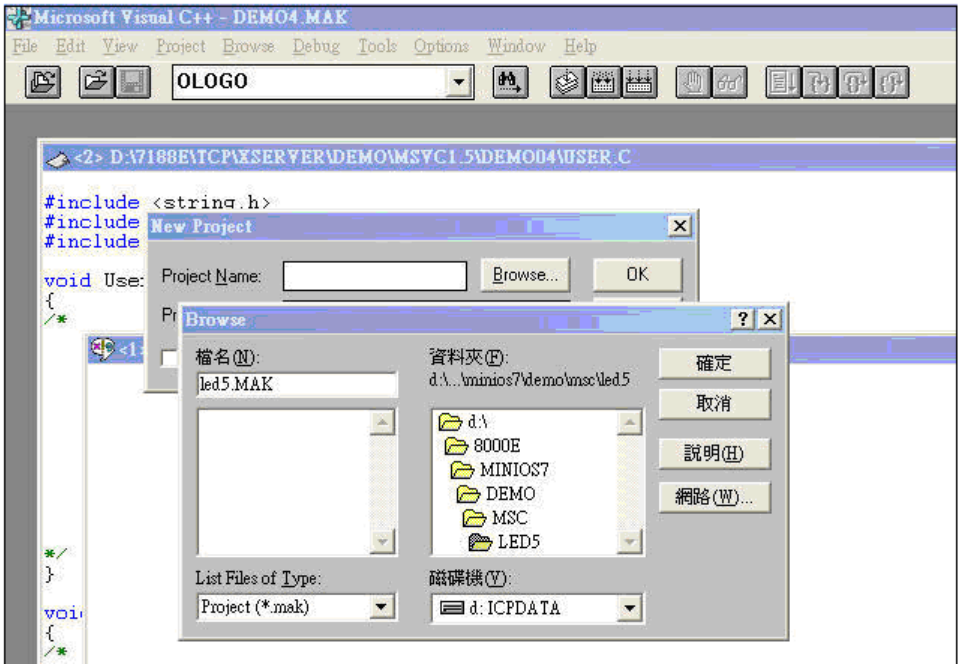


Step 3: A new executable file will be created if it is successfully compiled

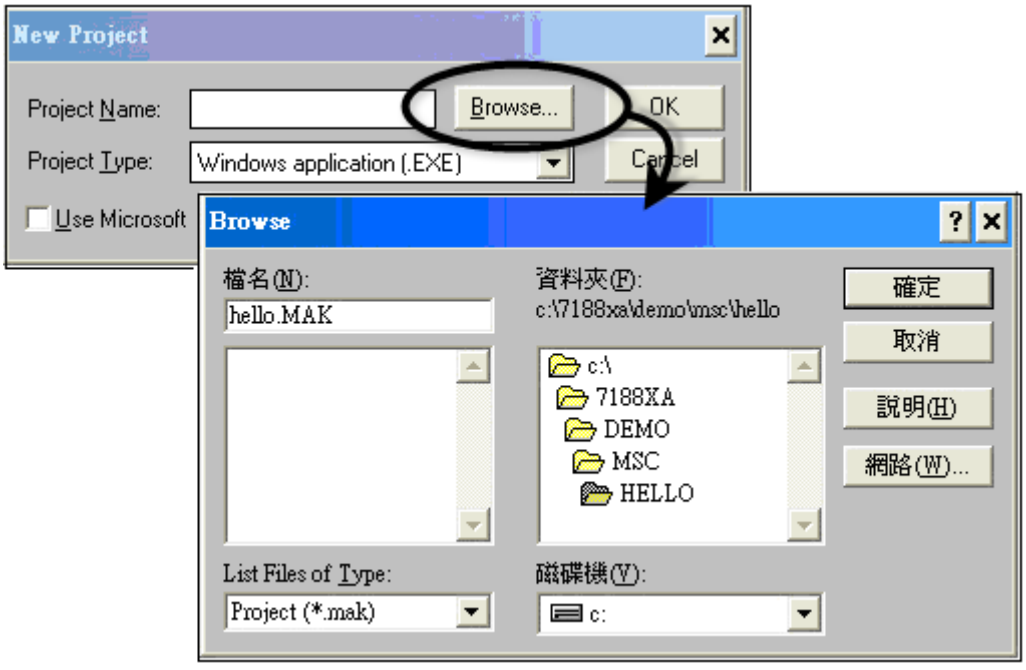


E.4. MSVC 1.50

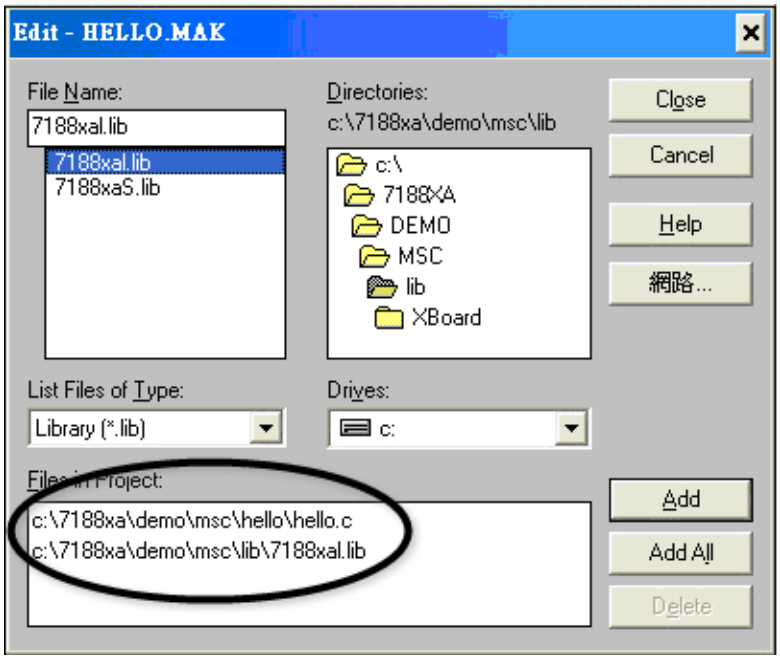
Step 1: Run MSVC.exe



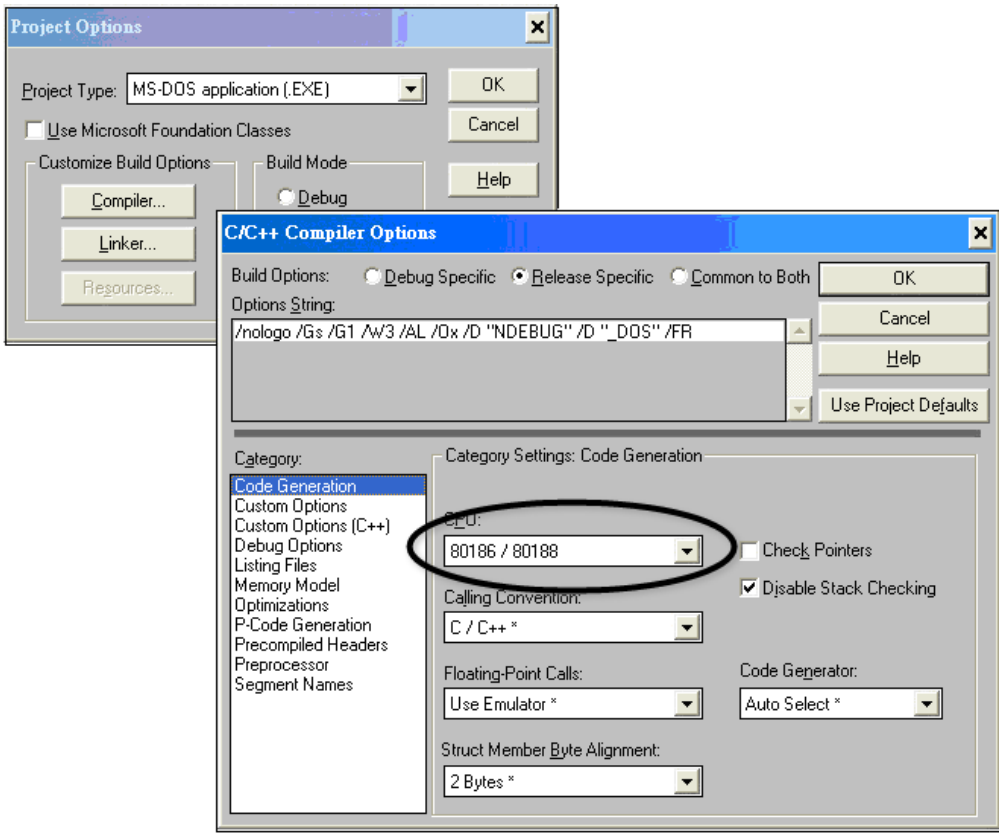
Step 2: Create a new project (*.mak) by entering the name of the project in the Project Name field and then select MS-DOS application (EXE) as the Project type



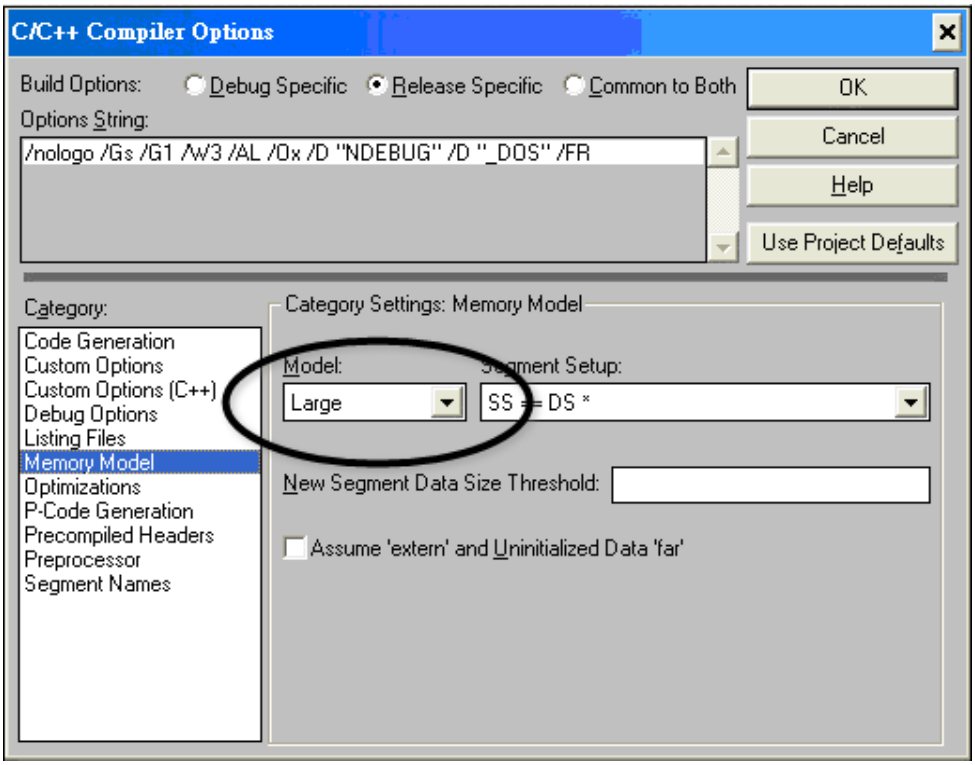
Step 3: Add the user's program and the necessary library files to the project



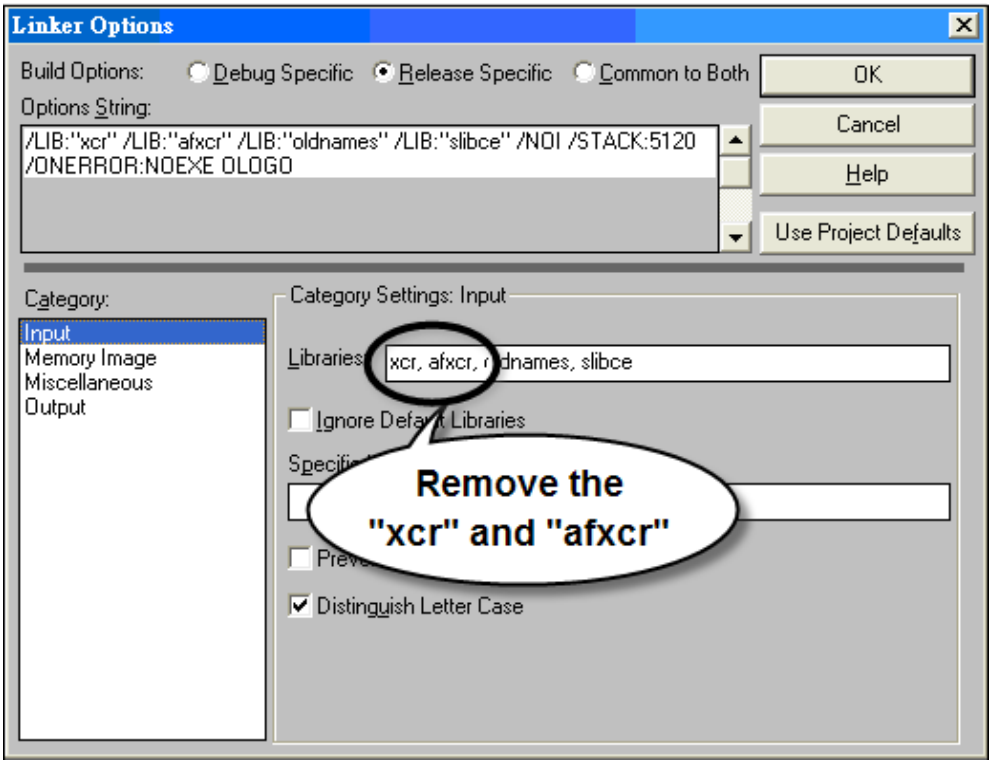
Step 4: Set the Code Generation on the Compiler.



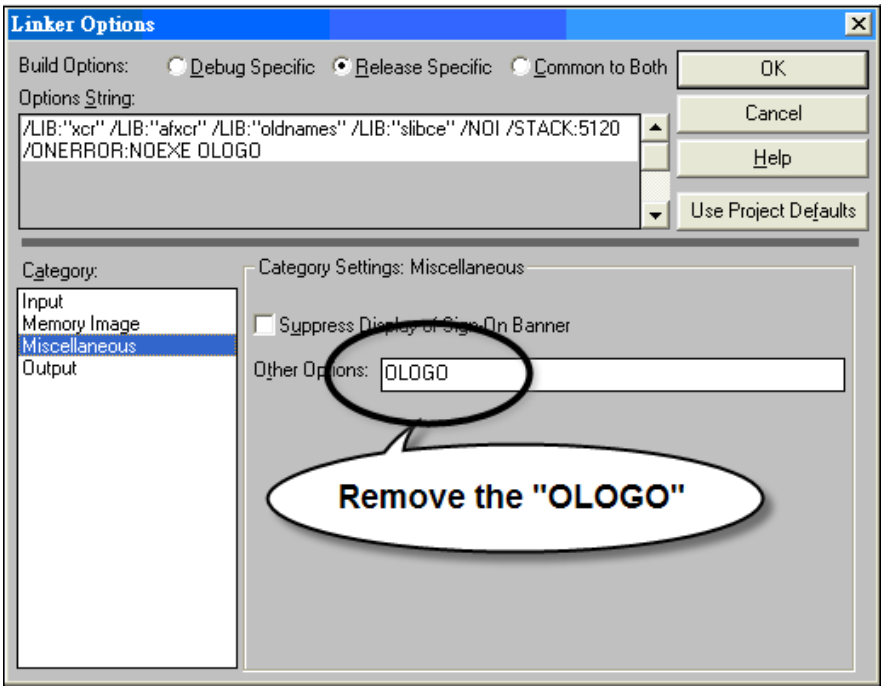
Step 5: Change the Memory model (large for 8000e.lib)



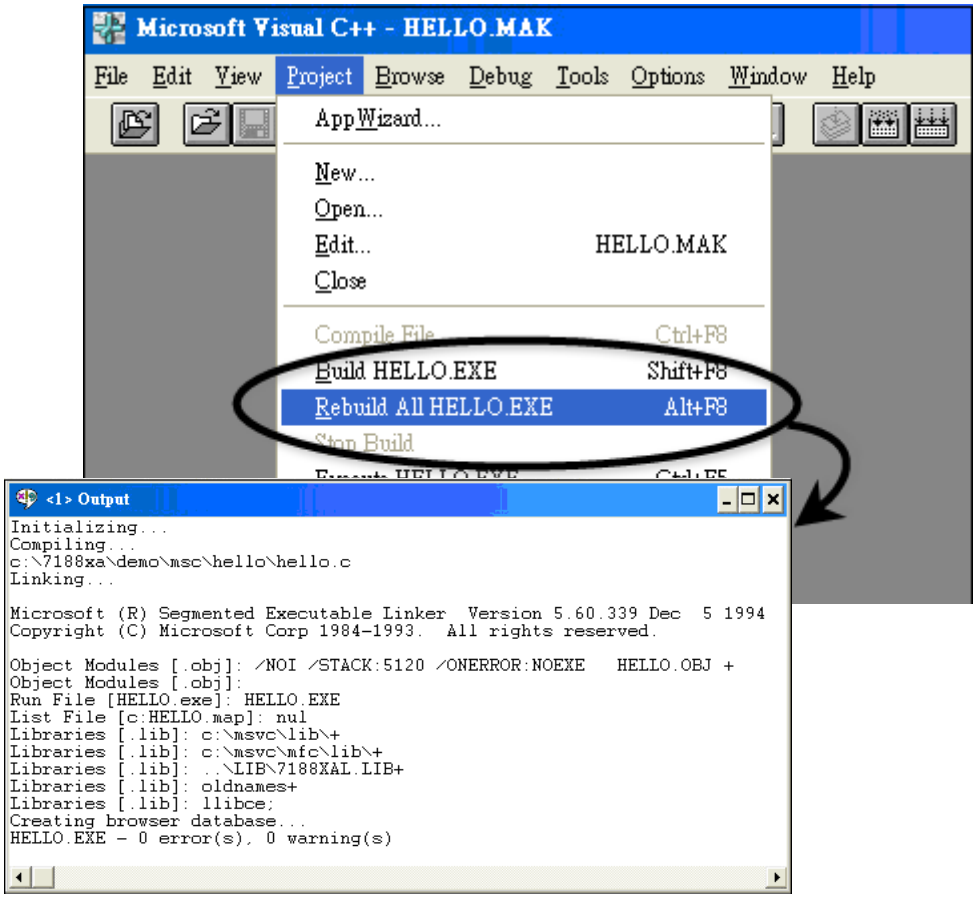
Step 6: Remove the xcr, afxcr library from the Input Category



Step 7: Remove the OLOGO option from the miscellancous Category.



Step 8: Rebuild the project

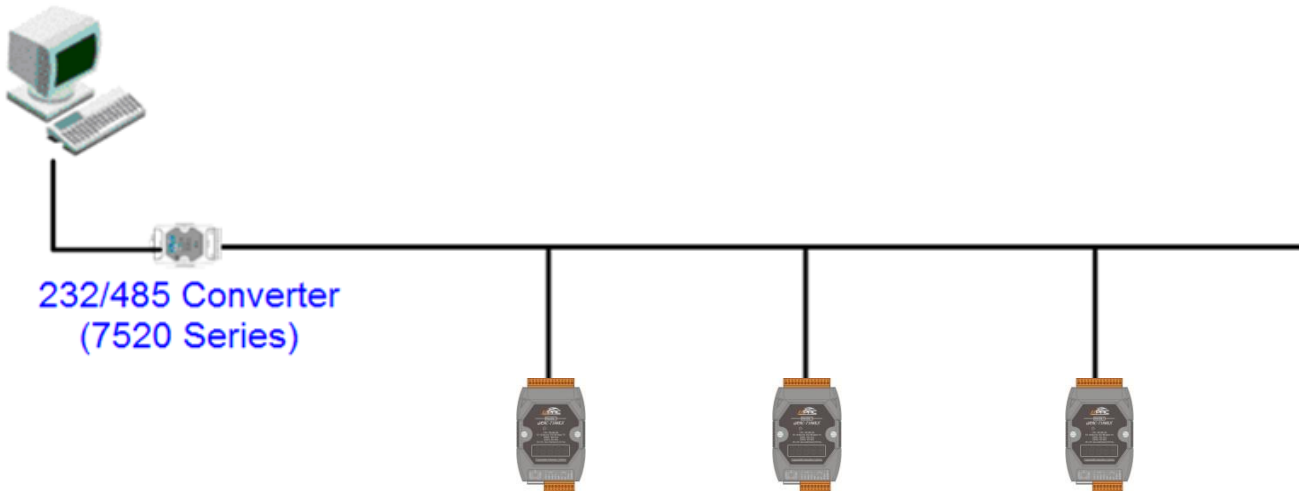


Appendix F. Application of RS-485 Network

The RS-485 length can be up to 4000 ft or 1.2 km over a single set of twisted–pair cables, if the RS-485 network is over 4000 ft or 1.2Km, the RS-485 repeater must be added to extend the RS-485 network.

F.1. Basic RS-485 network

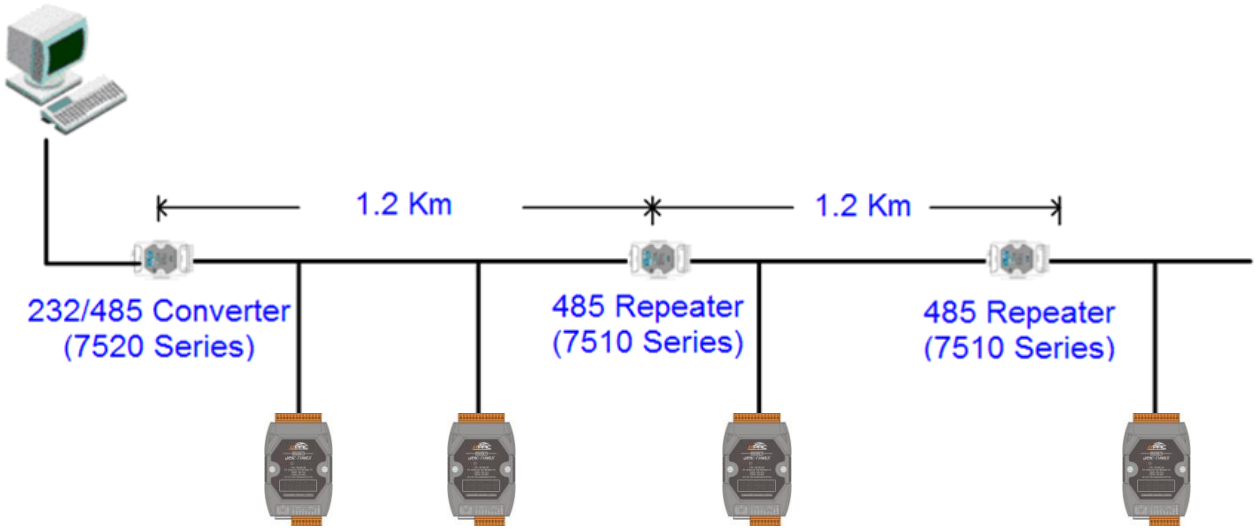
The basic component of the RS-485 network consist of a Master Controller (or using a PC as a host controller), and some RS-485 devices.



F.2. Daisy chain RS-485 network

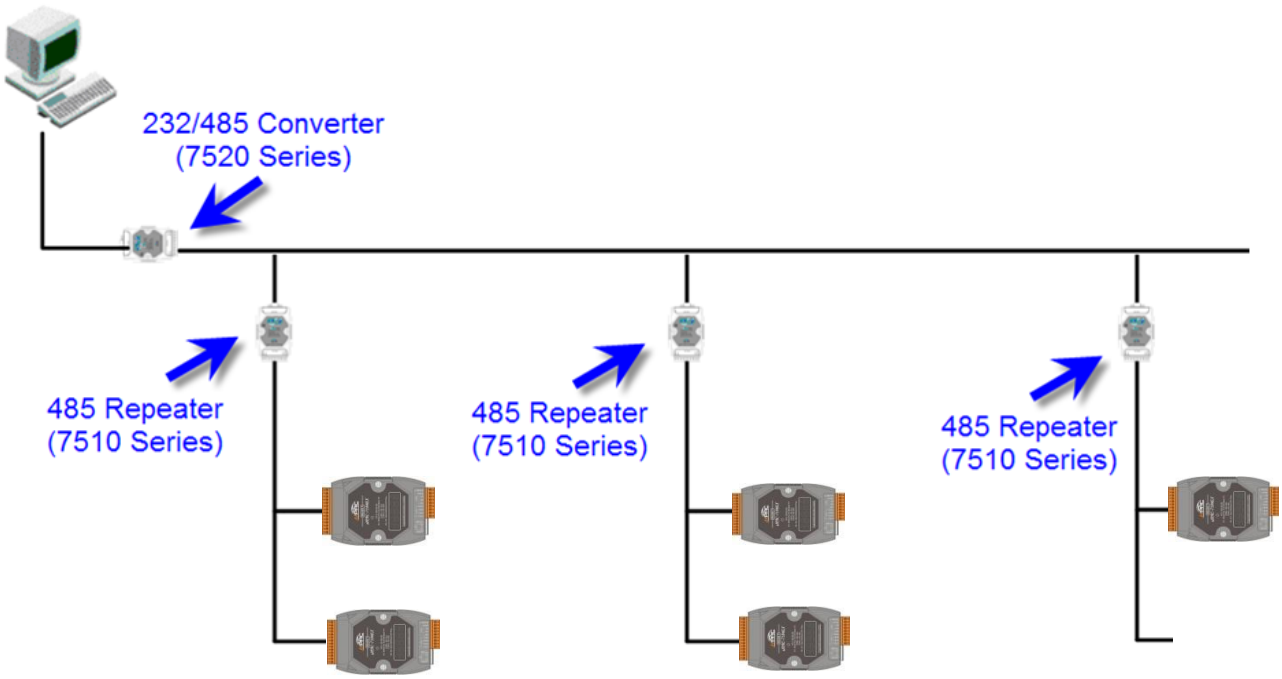
There are branches along the main network. In this case, it is better to have a repeater to isolate or filter the noise that is made by devices.

There is a better choice to use 7513 as a RS-485 hub on start type network.

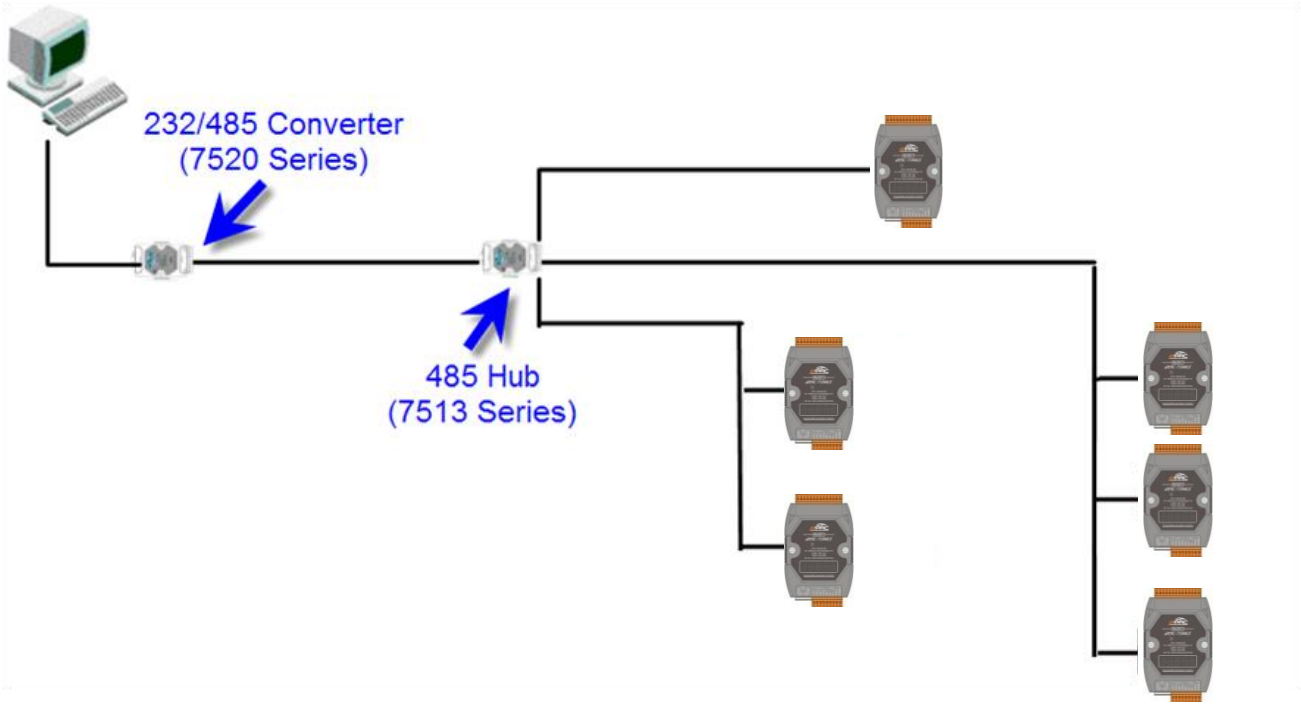


F.3. Star type RS-485 network

All RS-485 devices are wired directly to the main network, If the network is up to 1.2 Km, it will need a repeater (7510 series) to extend the network length.

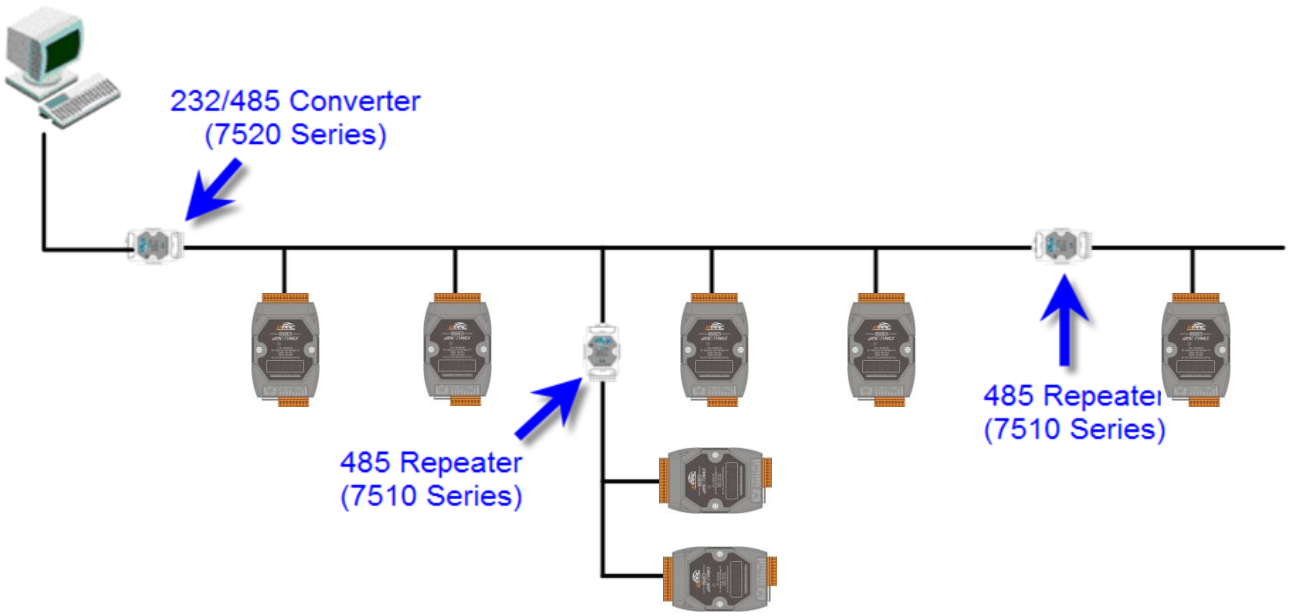


There is a better choice to use 7513 as a RS-485 hub on start type network.



F.4. Random RS-485 network

There are branches along the main wire. In this case, it is better to have a repeater to isolate or filter the noise that is made by devices.



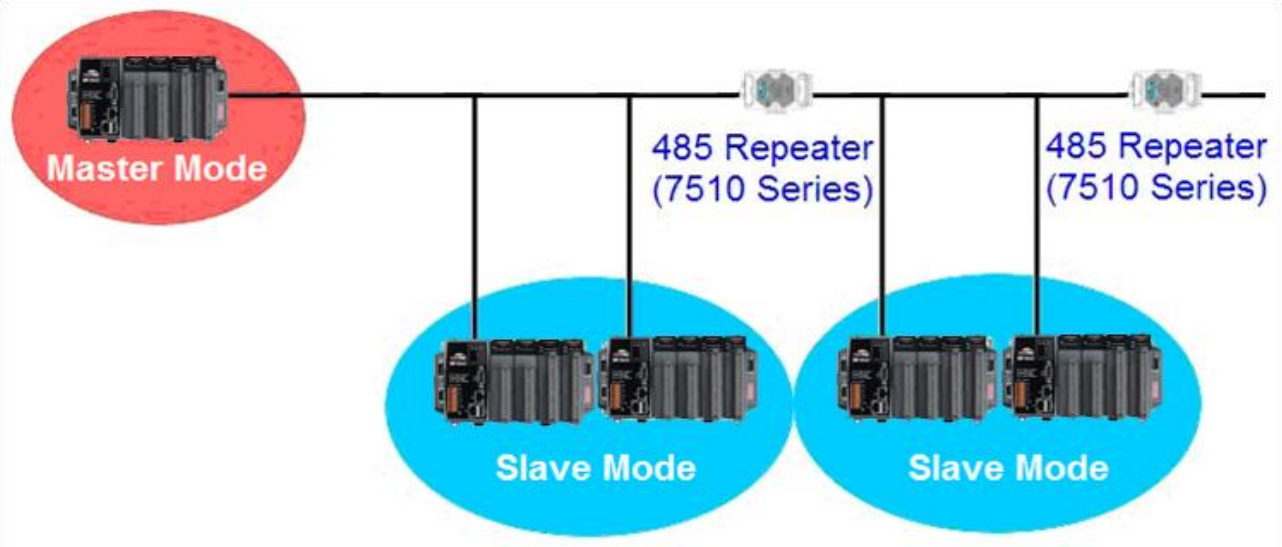
F.5. Pull-High/Pull-Low Resistors

The uPAC-7186EX provides two RS-485 serial port based on the master-slave architecture, all of which have a pull-high/pull-low resistor, you can set it to master mode or slave mode for implementing a RS-485 multi-drop network.

F.5.1. uPAC-7186EX as a Master

When one of uPAC-7186EX is set to master, then all the other devices on the same network must be slave mode. then the master one's (uPAC-7186EX) pull-high/pull-low resistors have to adjusted to enabled. Please refer to the Figure H-1 for the jumpers' setting of the pull-high/pull-low resistors which are located at the power board of uPAC-7186EX.

Figure H-1



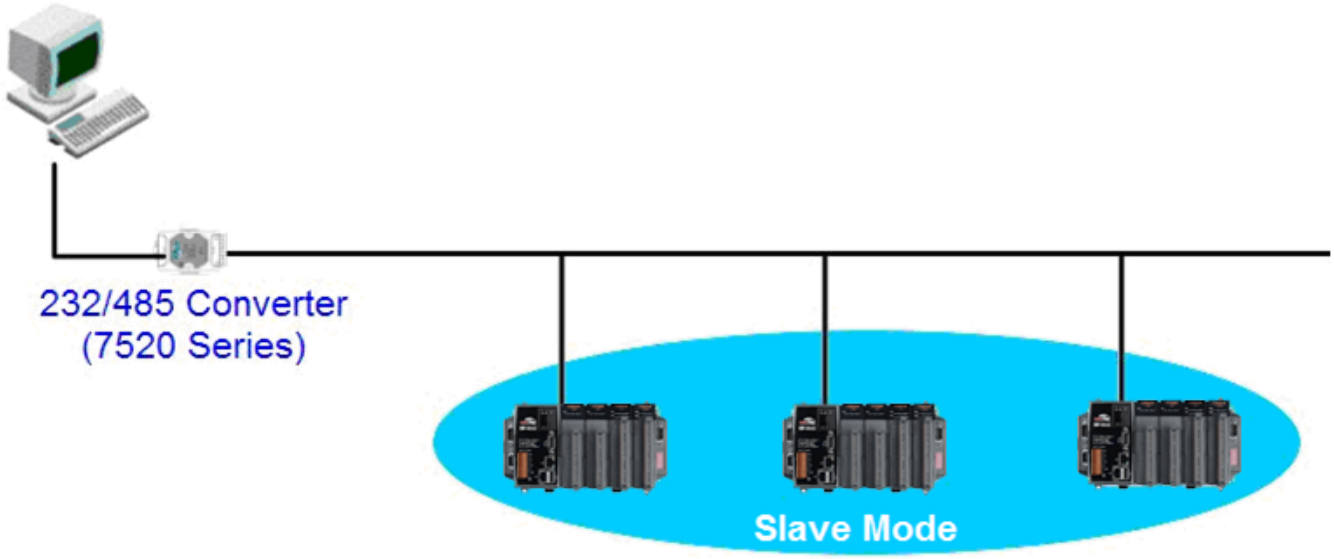
F.5.2. uPAC-7186EX as a slave

For most of application, when using one 7520 series as RS-232/485 converter, its pull-high/pull-low resistors are set to enabled. Then the uPAC-7186EX and all the other

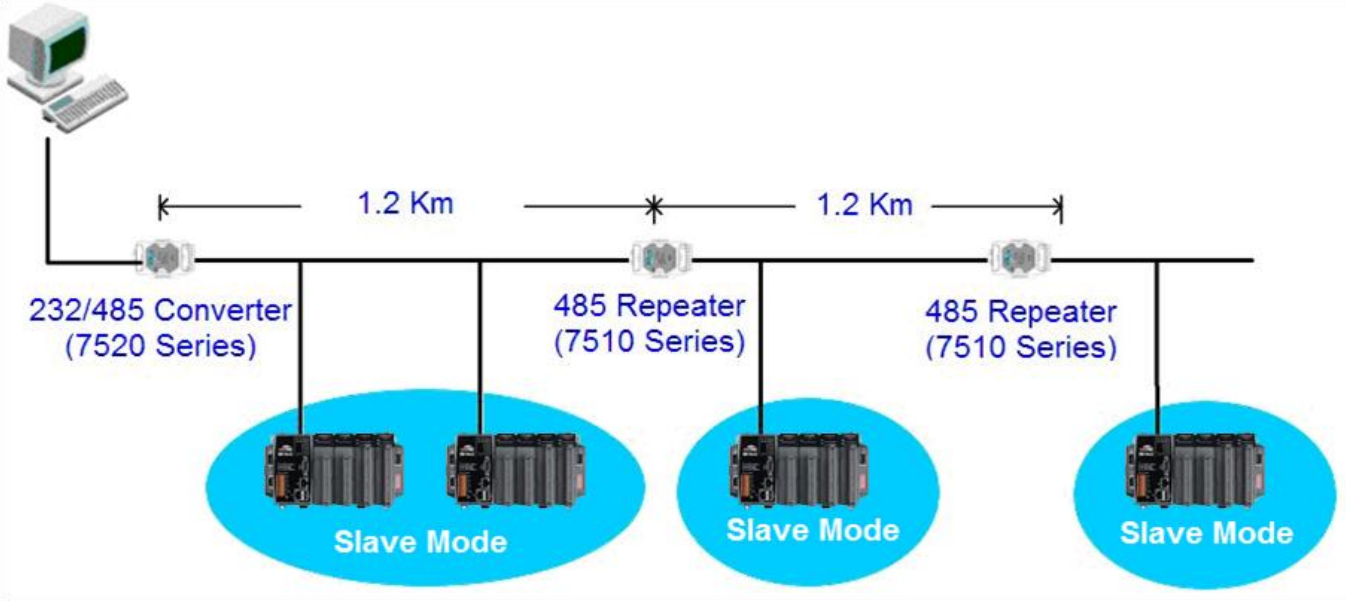
devices on this network must be slave mode (the pull-high/pull-low resistors must be disabled).

Please refer to the figure H-2 to for the jumpers' setting of the pull-high/pull-low resistors which are located at the power board of uPAC-7186EX.

Figure H-2



If there are repeaters on the RS-485 network, there will be pull-high/pull-low resistors on both sides of the repeaters (i-7510)


1.2 Km
1.2 Km
232/485 Converter
(7520 Series)
485 Repeater
(7510 Series)
485 Repeater
(7510 Series)
Slave Mode
Slave Mode
Slave Mode